SEPTEMBER 14, 1944

American Machinist

TECHNOLOGY DE

Crush Forming Speeds Production Of Ground Contours

•

Short Cuts for the Small Shop

•

Spinning Process Used in Making Superior Bomb Casings

•

Army Field Shops Repair and Rebuild Ordnance Equipment

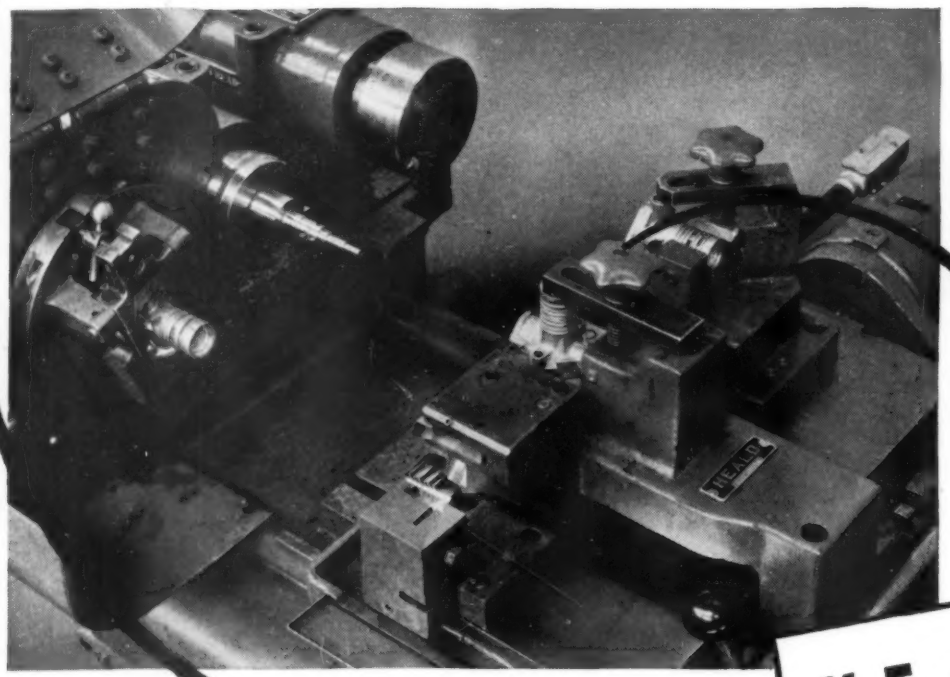
SEP 14 1944
DETROIT

What's Ahead in Forging

R v.88 S-O 1944

Fixtures for All Requirements

ON VERSATILE HEALD BORE-MATICS



This is fixture versatility . . . 13 different borizing operations are done on automotive governor bodies on the 3-station Heald No. 48A Bore-Matic shown here. Ready adaptability of Bore-Matics to practically any type of fixture made it possible to rotate one part in the front station, chuck a second piece in a stationary fixture in the middle station and hold a third part in the rear station in a stationary fixture on a hydraulic cross-slide, the latter feeding the part for a facing operation.

V.F. 4

HEALD DESIGNED TO SUIT YOUR JOB...

HEALD BUILT FOR BETTER, FASTER CHUCKING

YOU CAN IMPROVE accuracy, finish and production on all operations . . . on boring, turning, facing, chamfering, grooving, fly-cutting, on straight and taper surfaces, on curves and irregular shapes . . . by borizing on Heald Bore-Matics.

Versatility makes this possible . . . outstanding versatility in fixture methods, plus unusual flexibility in basic Bore-Matic design and tooling.

Widely diversified methods of work holding are available on Bore-Matics to suit all requirements. Work can be chucked in rotating fixtures or between centers, or can be held in fixed position in stationary fixtures. Stationary rotary-indexing fixtures, horizontal or vertical types, can also be furnished. When required, stationary fixtures can be mounted on cross-slides for indexing or retraction from tools. Hydraulic, pneumatic or manual clamping is available.

All-round versatility. . . in application, function, tooling and fixtures make Heald Bore-Matics THE MOST VERSATILE MACHINE TOOL. For more details, write . . . The Heald Machine Co., Worcester 6, Mass., U.S.A.

THERE'S A FIXTURE FOR EVERY BORIZING JOB...

- **Rotating Fixtures.**
- **Stationary Fixtures.**
- **Horizontal Indexing Fixtures.**
- **Rotary Indexing Fixtures.**
- **Automatic Fixtures.**
- **All Types of Fixtures are Available With Either Manual, Hydraulic or Air Clamping.**

HEALD *Bore-Matics*

THE MOST VERSATILE MACHINE TOOL

Tech

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To _____

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Signed _____

American Machinist Chips

Editorial Highlights . . . Here are a few reminders on *American Machinist* editorial features which we believe you'll want to be sure to read:

Previous issue — Bill Hargest's first story from the Normandy beachhead describing the mobile and floating machine shops used to speed invasion; Armament Section on the manufacture of naval torpedoes; story of automotive mass production techniques applied to aircraft cylinder heads.

This issue — Fifth in the series of "Metal-Working Tommorrow" Sections . . . "What's Ahead in Forging" . . . trends and predictions in this manufacturing operation . . . reprints available at 10c each; third installment in a complete, authoritative story on milling cutters and their usage; another article by Bill Hargest describing England's maintenance depots for repair of ordnance equipment.

Next issue—Third *American Machinist* Reconversion Section . . . dealing with actual reconversion at L. C. Smith-Corona Typewriters, Inc., plus a digest of the recently enacted Contract Termination Law and also how the Harvey Machine Co. successfully planned for contract termination; report of the influence of cutting fluids on cutting speed, tool life, chip formation and other factors, when applied at various temperatures from 55° F. to 150° F.

Metal-Working . . . And How! . . . Allis-Chalmers recently stated that they were turning out a line—or lines—consisting of 1600 different machines, tools, appliances and tractors.

Trail Blazer . . . When International Harvester recently settled a $217,000,000 Army tank contract, it was after 16 months of negotiations. Thanks to the experience gained in this huge settlement, and to development of the Army's organization for handling terminations, it is said that a similar settlement could now be completed in 4 to 6 months.
We hope.

Bearing First . . . We learn from the publication *The Reservoir*, of Bound Brook Oil-Less Bearing Company, that as far back as 1883 the company began manufacture of graphited bronze bearings.

Things We Never Knew Before . . . This has nothing to do with Metal-Working but some of you may have shared our erroneous impression that the name "Dixie" as generally applied to the South stemmed from the famed Mason-Dixon line.

The fact is that the nickname "Dixie" was first used by Mississippi boatmen and traders, derived from the $10 notes printed by the New Orleans banks shortly after Louisiana became a part of the U. S. Each note was a "dix," French for ten, which the Yankees mispronounced "dicks." Collectively they were called "dixies" and this eventually was applied to the city of their origin, New Orleans. From there it spread to the South as a whole.

Plane Production . . . The 7 West Coast warplane companies teamed in the Aircraft War Production Council passed, right after the invasion, the 100,000 mark in warplane production. The industry nationally this year is expected to achieve a production volume 6 times that of the automobile industry at its peak. Pacific Coast plants are expected to produce approximately one-third of that tremendous volume.

In the above plants employee productivity gained 43.64% in the 11 months ended June 30, 1944. The manpower problem continues complex—largely due to the disappearance of workers from the labor market.

Survey . . . Many of you have been very generous with your time in helping us make a study of conditions in the Metal-Working industry. To those who cooperated either through personal interviews or mail questionnaires, we want to extend once more our sincere thanks.

This study—which we hope to have completed by October 1—will reveal some very interesting facts and comments on the manpower situation, expectancy of post-war production volume, amount and condition of machine tools now installed and estimated post-war purchases of machine tools. The information obtained will, we believe, be of value to many Metal-Working executives in double checking their own situations and in planning for post-war business.

From the Mailbag . . . Here is another comment from a reader on the value of the advertising pages in *American Machinist:*

"American Machinist *and a few other selected trade and technical magazines are read and used as reference works by our staff members and also at times by our field safety engineers. These men are either practically or technically trained, and most of them are both. Frankly, in the writer's opinion, the advertisements get more attention than the text . . . although both are read. We depend upon advertisements to keep up to date on new developments in machines, methods and processes—as it is our observation that once something new is ready for the market, the producer immediately advertises it so as to get, among other things, all the credit possible for its development.*
"From our standpoint, it is necessary to keep up with the times and know what is going on, and we find these ads to be among the very best ways of doing so."
Geo. H. Calhoun, Special Investigator, The Industrial Commission of Ohio. Columbus, Ohio.

BEVEL GEAR DRIVES — TO *Victory*

Bombsights depend on fine-pitch bevel gears like these for their accuracy.

Official U. S. Air Force Photo, *Signal Corps - International*

PRECISION BOMBING BY MECHANICAL BRAINS

Modern U. S. bombsights are responsible for the deadly accuracy of our Air Forces' high altitude bombing which is hastening the day of victory.

Once set exactly on the target by the bombardier, these bombsights perform virtually as a mechanical brain, automatically taking into account all variables and capable of dropping a bomb from 20,000 feet into a "pickle barrel."

BEVEL GEARS CONTRIBUTE REQUIRED ACCURACY

When this mechanical brain is set on the target and takes control of the plane, moments are tense and success of the mission depends upon its perfect functioning. Absolute synchronization and smoothness of motion of all parts is essential. It is here the accuracy of the gears in the mechanism counts.

Super-precision bevel gears, designed by Gleason engineers and manufactured in accordance with improved Gleason production techniques, have successfully met every such action test.

These bevels are cut to extremely fine tolerances for pitch line concentricity and tooth spacing. The method of tooth generation on latest Gleasons gives the accuracy of profile and high degree of surface finish necessary for the smooth operation of the unit.

Quick assembly with zero backlash is possible by virtue of the axial adjustability of bevels. This advantage is of great value, especially in the case of differential applications in the mechanism.

CUT ON GLEASON MACHINES

Mass production of these super-precision bevel gears is accomplished on the Gleason 3″ Generators, aided by essential Gleason auxiliaries.

Bevel gears are important parts of many other control instruments for peace as well as war. Gleason engineers will be glad to help you design bevels for these applications and select machines for their manufacture.

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER 3, N. Y., U. S. A.

PLAIN HYDROMATIC MILLER WITH CLOSE-COUPLED

mills both gaps at the same time!

CINCINNATI

Above is a CINCINNATI *Plain Hydromatic Miller. The Hydromatic is also available in a duplex style. Specifications and complete information are contained in catalog M-955-1. A brief description of these machines is given in Sweet's Catalog File.*

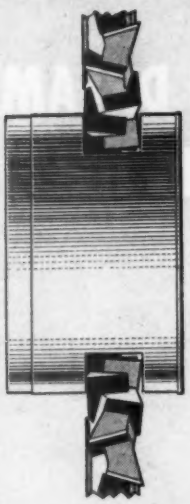
The equipment shown on the opposite page is an example of what can be accomplished with standard basic and complimentary units to handle a job which otherwise might require a special machine to obtain satisfactory production. The machine is a CINCINNATI 34-36 Plain Hydromatic Miller equipped with raised headstock, a pair of close-coupled spindle carriers, standard Index Base on table, two hand-clamping fixtures, and five-inch diameter cutters. The operation consists of milling two gaps at gudgeon pin bosses of aircraft pistons. Facing in opposite directions, the fixtures are set on an Index Base. The operator unloads and loads the fixture facing toward him, while the part in the other fixture is being milled. After the table automatically returns and stops, he swings the base into position for milling the second part, and starts the machine. This is known as the *Index Base Method of Milling.* With the proper type of units, fixtures and cutters, this method is ideal for milling operations on many peacetime products. ¶ It will be to your advantage to talk over your future milling plans with CINCINNATI Application Engineers. This group has developed efficient and economical ways to handle a wide variety of difficult milling operations.

Keep on buying WAR BONDS

THE CINCINNATI

MILLING MACHINES

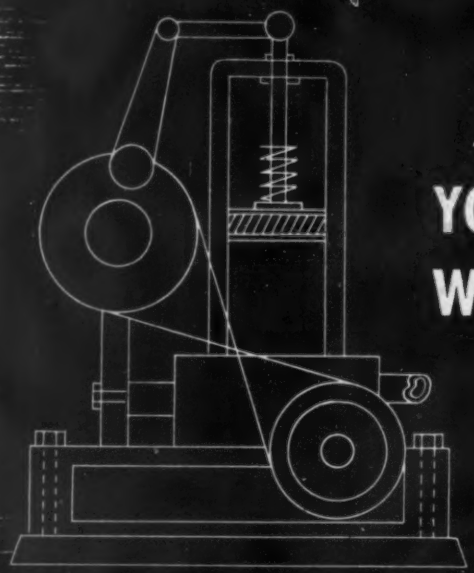
SPINDLE CARRIERS



Simplified drawing showing how the work passes between the two cutters to mill both gaps at the same time.

MILLING MACHINE CO. CINCINNATI 9, OHIO, U. S. A.

BROACHING MACHINES • CUTTER SHARPENING MACHINES



YOU DREAM IT... WE'LL HELP BUILD IT!

YOU see, that's our business . . . building things . . . all sorts of things.

Jones & Lamson is the oldest machine tool company in America and there is literally no industry (and few important products) to which Jones & Lamson engineering has not contributed, both in war and in peacetime production.

So you dream it . . . we'll help build it.

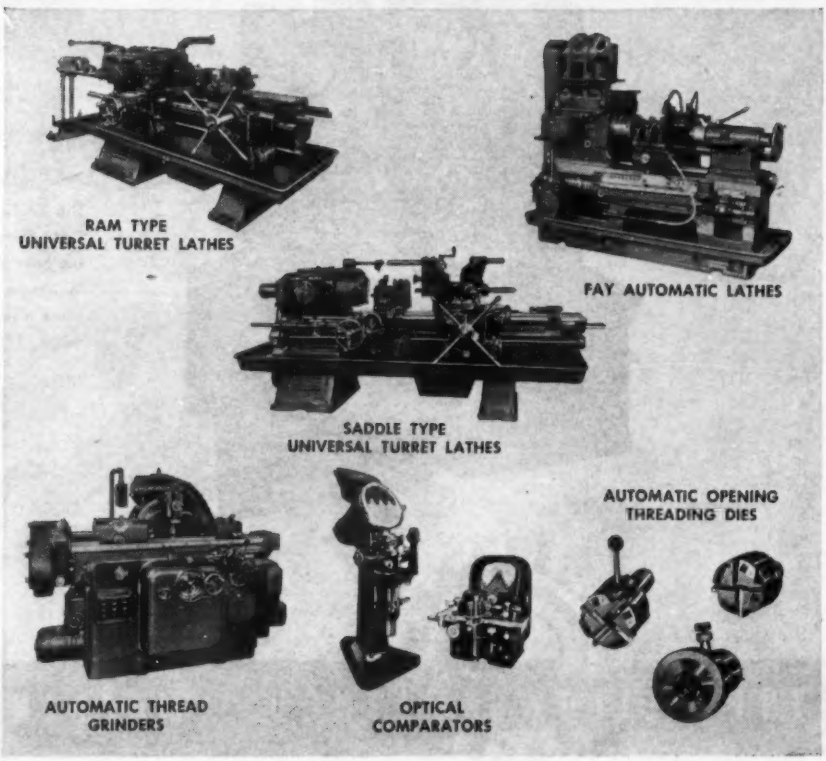
We'll draw up complete production specifications. We'll engineer the tooling. We'll specify, design, and create any special machine tools needed. We'll even plan the plant and its equipment.

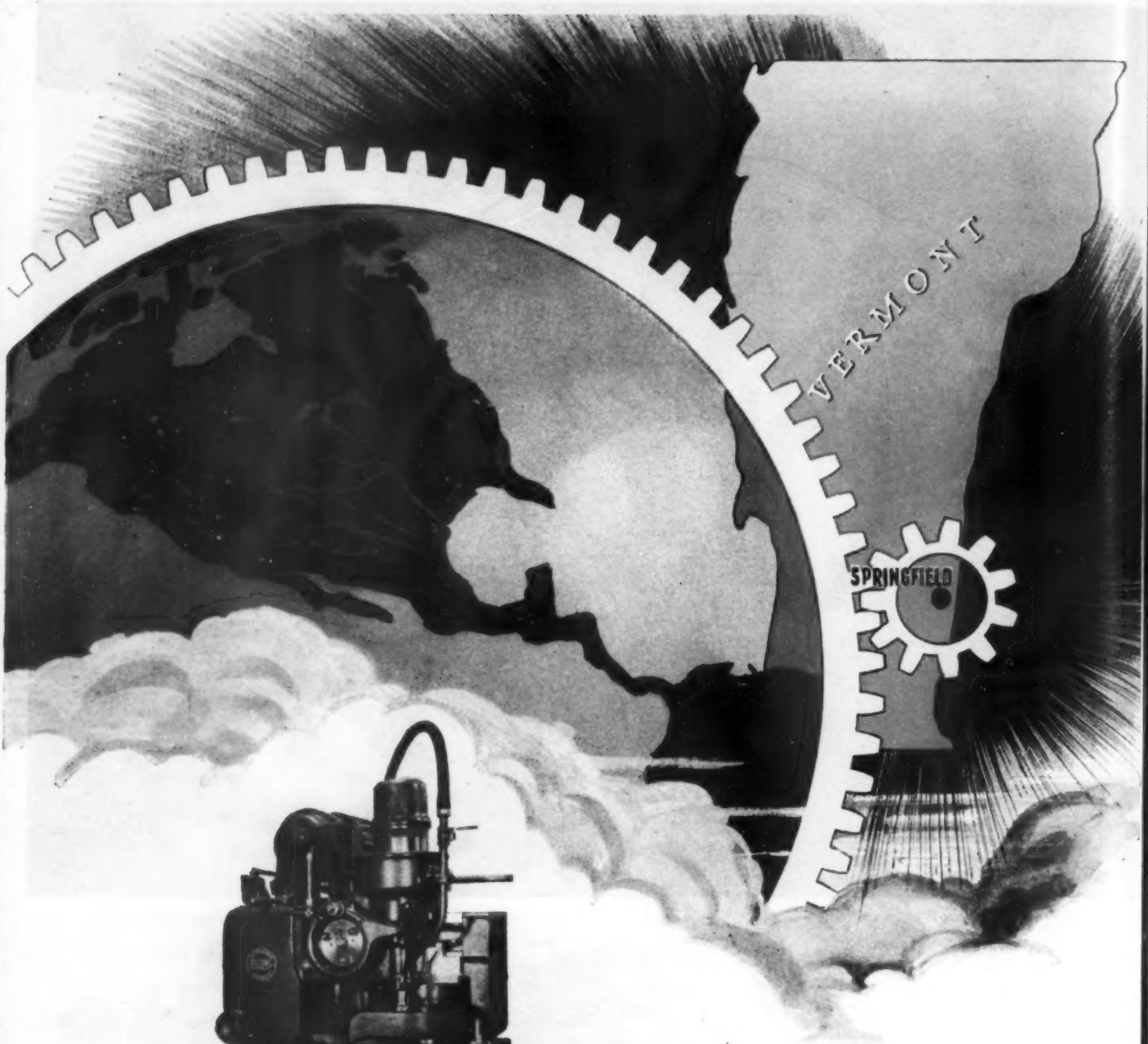
You dream it.

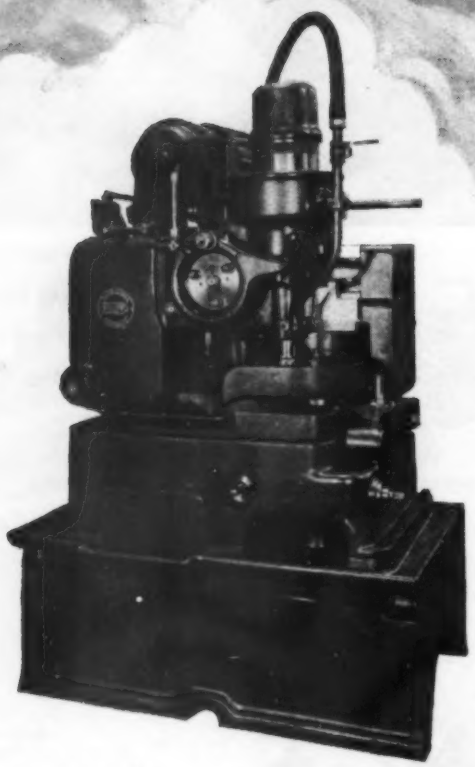
We'll help build it . . . from the ground up, if need be.

JONES & LAMSON
MACHINE COMPANY
SPRINGFIELD, VERMONT, U. S. A.

Manufacturer of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.







The 7A-Type High-Speed Fellows Gear Shaper can be equipped to cut both spur and helical gears. Maximum capacity is 7 inches pitch diameter, 2 inches face width, 5/7 diametral pitch.

THE FELLOWS METHOD...MACHINES AND TOOLS FOR

CONTROLLED GEAR PRECISION...

originated in Springfield, Vermont

Nestling among the green hills of Vermont is the village of Springfield, known throughout the World as the center of *Controlled Gear Precision*. Here at the Fellows Plant is a group of gear specialists, who have influenced and continue to influence in a large degree the remarkable progress that is being made in precision gear design and manufacture.

The results of their efforts are being reflected in better gears for products made throughout the World. Today in better gears and other parts for use in planes, tanks, guns, etc., which are battling for freedom on many fronts. Tomorrow it will be for peace-time products: automobiles, trucks, textile machinery, and household appliances for better and more peaceful living.

The Fellows Method includes machines for generating, finishing, and measuring gears of infinite precision. Above all, it is practical. It has helped men in widely divergent industries to make a finer product, at lower cost. It may well help you to do the same. Write for literature. Address: The Fellows Gear Shaper Company, Springfield, Vermont . . . also 616 Fisher Bldg., Detroit, Mich. . . . and 640 West Town Office Bldg., Chicago, Ill.

Fellows

ALL OPERATIONS FROM BLANK TO FINISHED GEAR

Did you know—

YOU CAN GRIND 12 INCH DIAMETERS CINCINNATI CENTERLESS

Grinding bearing races of 12" diameter by the centerless method is quite an accomplishment in itself. Those being ground in the illustration at the right presented still another problem — the outside diameter had to be exactly square with the previously ground faces. This was accomplished on a CINCINNATI No. 4 Centerless Grinding Machine, having increased capacity, with a special infeed work rest. ¶ In the retracted position, two parts are placed on fingers in the front movable section of the work rest. As they are advanced into the grinding throat, the parts ride up on the work rest blade, losing contact with the positioning fingers. Further movement squares up the parts between the front and rear locating surfaces, which are exactly parallel with each other. Then follows a hand infeed movement of the regulating wheel slide to size the parts. ¶ This setup again demonstrates the ability of CINCINNATI Application Engineers here at Grinding Headquarters to apply the economical centerless method to unusual grinding problems. Take advantage of their wide experience and grinding know-how.

Illustrated at the left is the CINCINNATI *No. 4 Centerless Grinding Machine. Complete specifications may be obtained from the factory.* CINCINNATI *Centerless Grinders are also available in No. 2 and No. 3 sizes. For a brief description of these machines, look in Sweet's Catalog File.*

Keep on buying WAR BONDS

CINCINNATI

CENTER TYPE GRINDING MACHINES

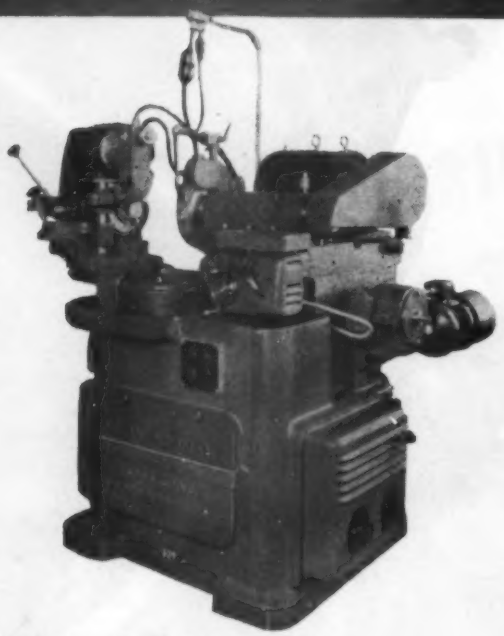
View from the rear of a CINCINNATI *No. 4 Centerless Grinding Machine, having increased capacity, and tooled up to grind the outside diameter of 12" diameter bearing races.*

GRINDERS INCORPORATED

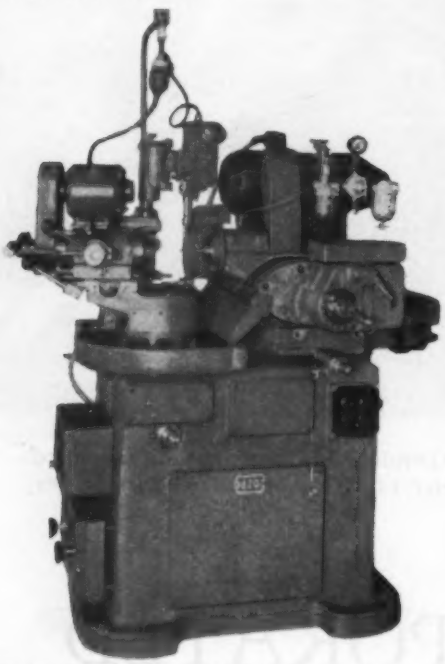
CINCINNATI 9, OHIO, U. S. A.

CENTERLESS GRINDING MACHINES • CENTERLESS LAPPING MACHINES

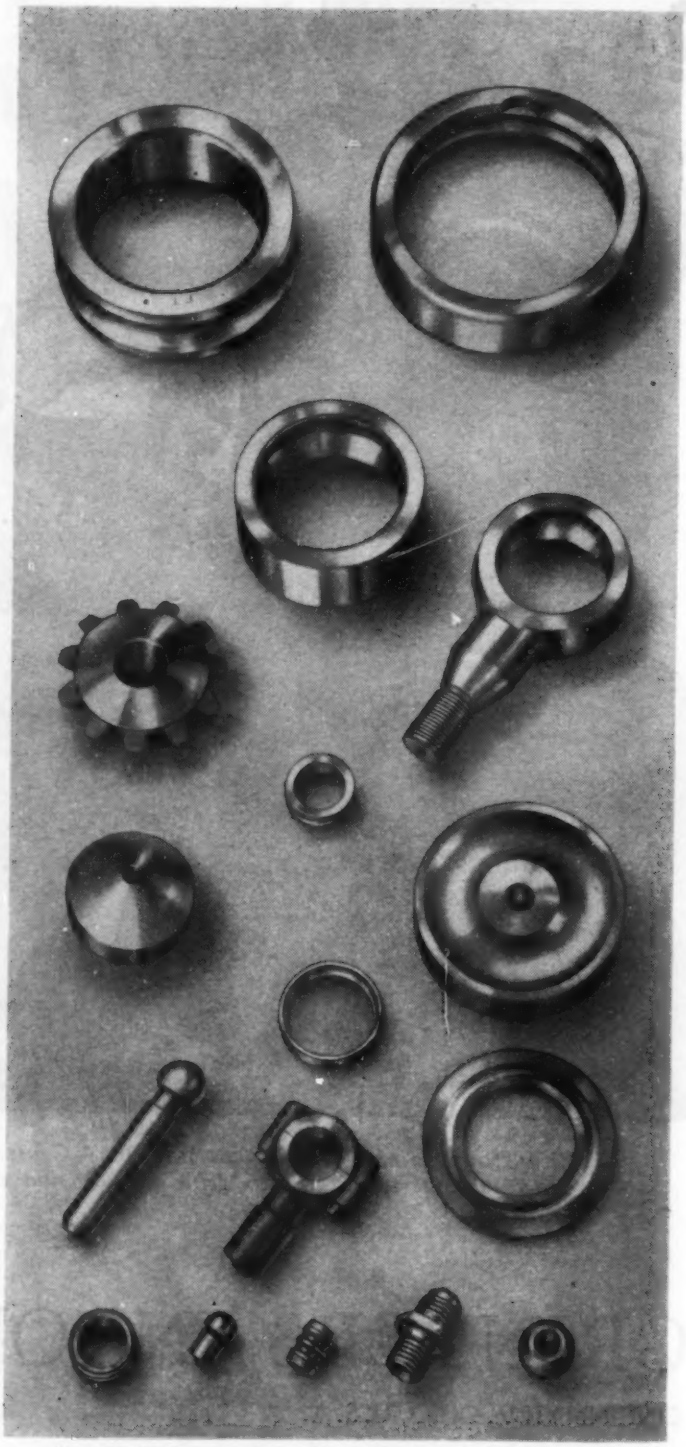
Leadership...



No. 639 for external grinding of inner races from 1¾" to 7½". Built for heavy-duty service, this model is capable of performing a wide range of grinding operations at high production rates.

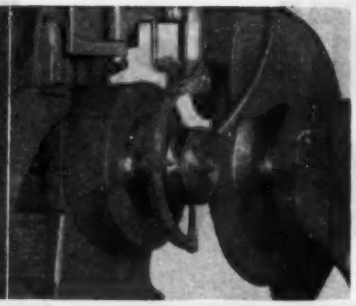


Model 620—Designed particularly for internal grinding of outer raceways of the smallest sizes and up to 204 size. Supplied with a motorized workhead providing high speed workhead spindle.



Illustrated above are but a few of the many types of grinding operations performed on Van Norman Radius Grinders.

more ball bearing races are ground on

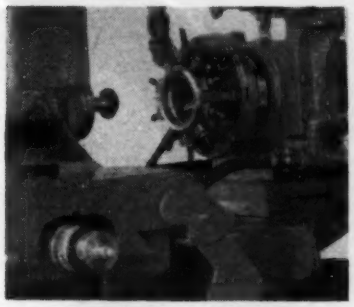


Internal grinding of outer race.

VAN NORMAN

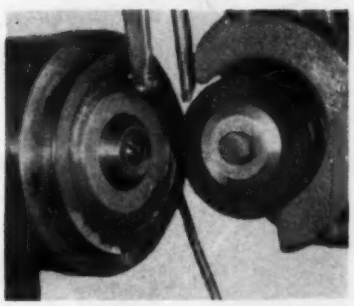
OSCILLATING RADIUS GRINDERS

than on all other machines



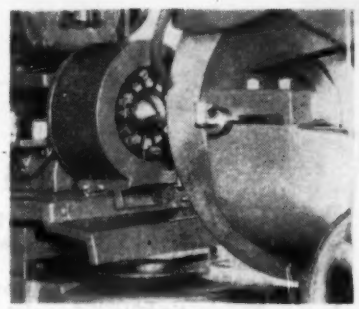
External grinding of inner race.

For 30 years Van Norman Oscillating Radius Grinders have predominated in the ball bearing field. In fact, today more ball bearing races are ground on Van Norman Grinders than on **all** other machines combined. This world-wide preference for Van Norman is based on characteristics that do not appear in specifications—ruggedness, accuracy, sensitivity, efficiency, ease of operation and low maintenance and operating costs.



Grinding a thrust bearing.

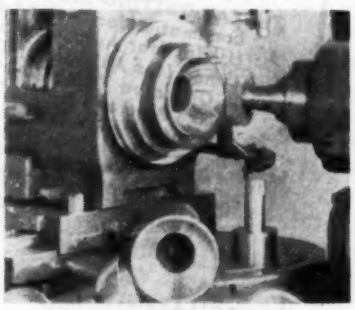
Such outstanding advantages as—wide angle oscillation, electronic gauging, continuous feeds, automatic retraction, diaphragm chucks, wide variety of grinding cycles and automatic operation assure high output, low cost production of ball bearing races and other spherical surfaces.



Grinding spherical Swivel cap.

Van Norman Grinders are available in a wide range of types and sizes . . . from $\frac{3}{8}$" diameter to 40" diameter for ball race or spherical roller work and all types of industrial applications. They all have a built-in facility for grinding double row races.

Our engineers are always available for the solution of grinding problems. Write for their services, today.



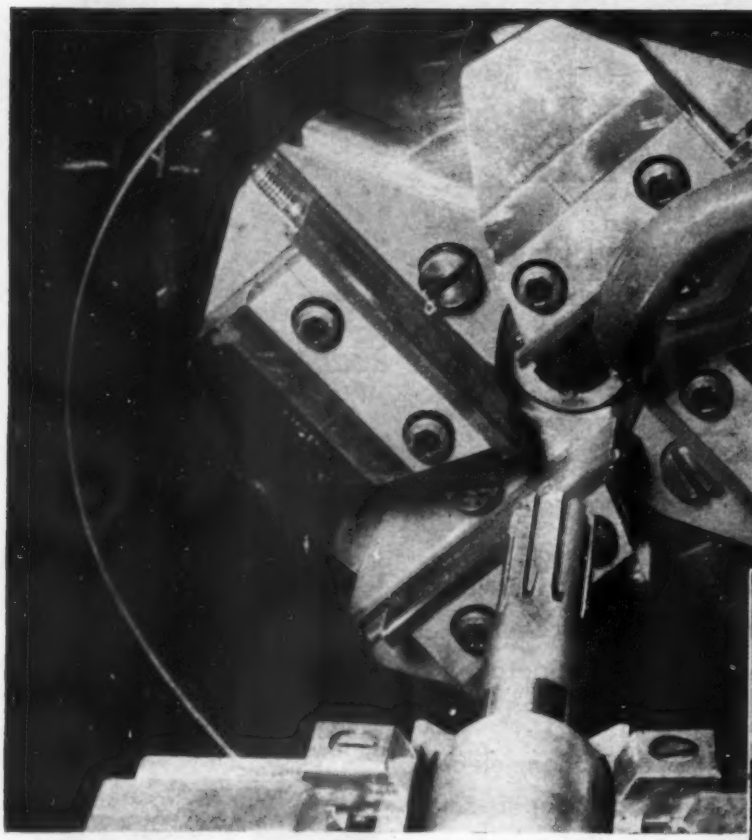
Grinding spherical bearing surface in automotive part.

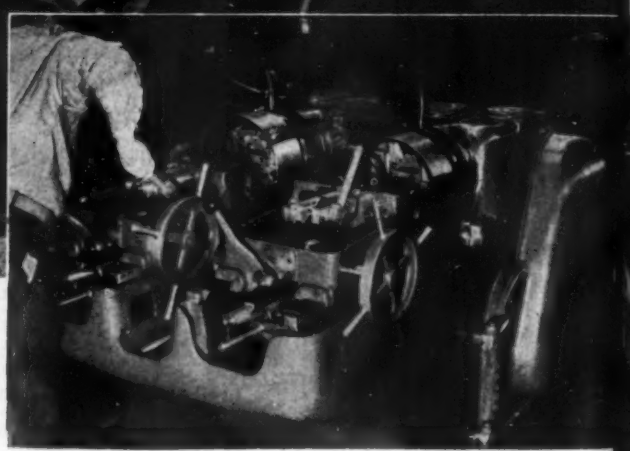
VAN NORMAN COMPANY

SPRINGFIELD 7, MASS.

"It pays to Van Normanize"

Threading Automotive Parts...The Landis Way





The Landmaco Threading Machine threading spiral hypoid drive pinions. These pinions must be precisely made for perfect assembly, as, once assembled, they are never expected to require attention.

The LANDIS LINE

THREAD CUTTING MACHINES
- Landmaco Threading Machines
- Bolt Factory Threaders
- Automatic Forming and Threading Machines
- 4 Spindle Semi-Automatic Threading Machines
- Pipe and Nipple Threading Machines

THREAD CUTTING DIE HEADS
- Landmatic (for Turret Lathes and Screw Machines)
- Landex (for Automatic Screw Machines)
- Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
- Lanco Pipe and Nipple Threading Heads
- Stationary Pipe Die Heads
- Reverse Taper Die Heads
- Standard Rotary Die Heads

PRECISION THREAD GRINDERS

PIPE THREADING AND CUTTING MACHINES

ROLLER PIPE CUTTERS

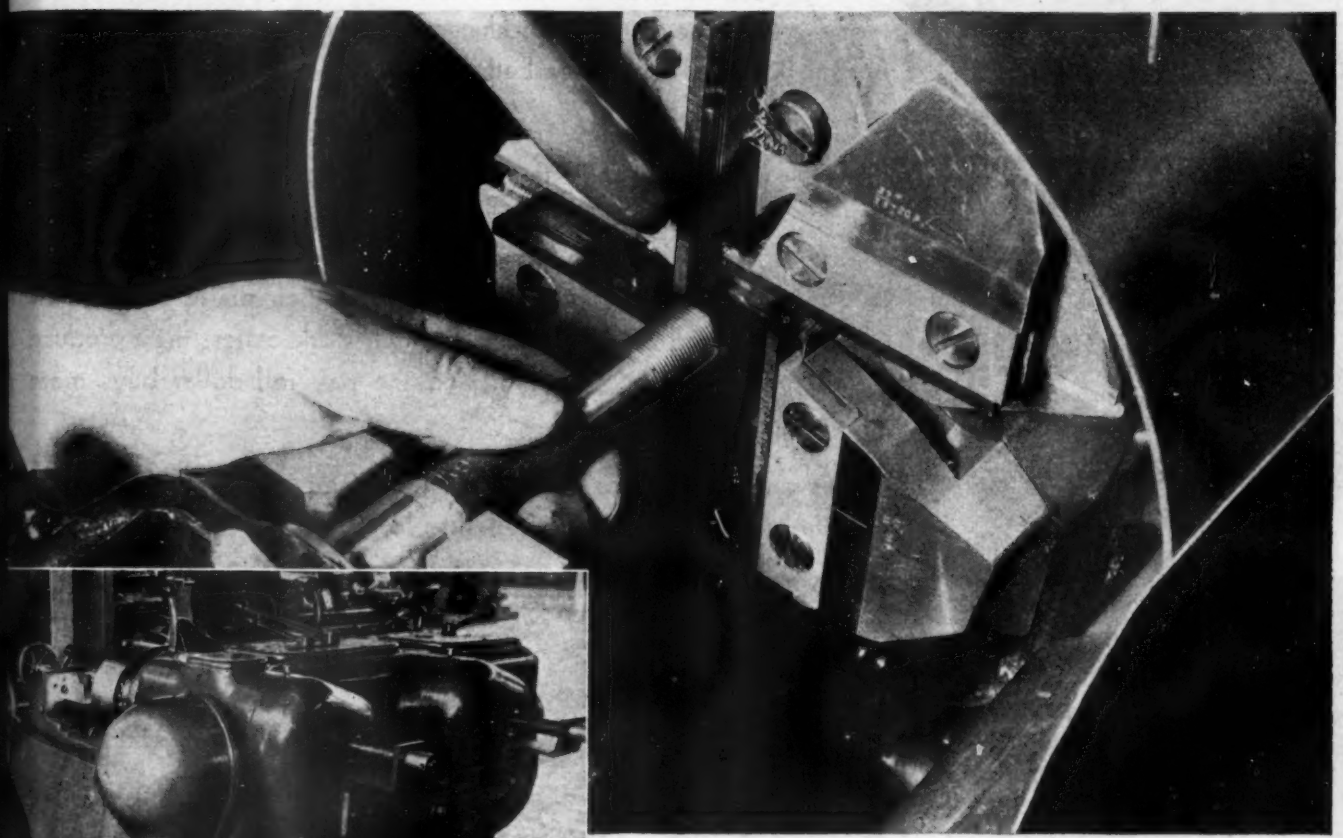
CHASER GRINDERS

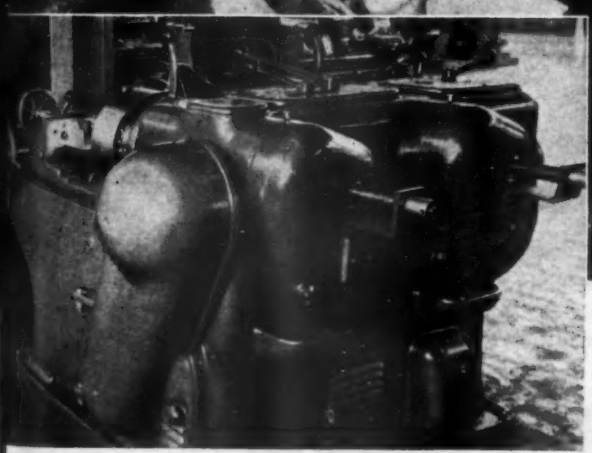
COLLAPSIBLE AND ADJUSTABLE TAPS

Write for the Booklet
"BE THREADWISE"

LANDIS THREADING MACHINES are used extensively in automotive plants. Accuracy is of prime importance. Threads must meet the most rigid requirements and must conform exactly to specifications. Besides accuracy, other features are—economy, ease of operation and high productivity with resultant low cost.

The widespread use of Landis Threading Equipment throughout the automotive industry—where threads must be held to closest tolerances—is just another proof that thread production throughout all metal industries can be safely and economically handled by Landis Threading Machines and Die Heads.





The Landmaco Threading Machine threading truck steering knuckles. Threads must be exactly right to assure the permanent holding of a vital part in a truck steering mechanism.

LANDIS REG. U.S. TRADE—MARK

LANDIS MACHINE COMPANY

WAYNESBORO · PENNA · U·S·A·

27 Spindle Speeds

with only 2 *control levers*

Convenience of control and ease of operation are two of the outstanding characteristics of the new "American" Pacemaker Lathe.

Imagine being able to secure any one of 27 spindle speeds thru only 2 conveniently placed direct reading levers without having to refer to index plates or having to retain lever positions in one's mind. Operators are enthusiastic in their praise of this new speed control. It makes their work easier; they produce more work because of it and the pay roll dollar buys more as a consequence.

This and other fine features of the "American" Pacemaker are thoroughly covered by Bulletin No. 15.

THE AMERICAN TOOL WORKS COMPANY

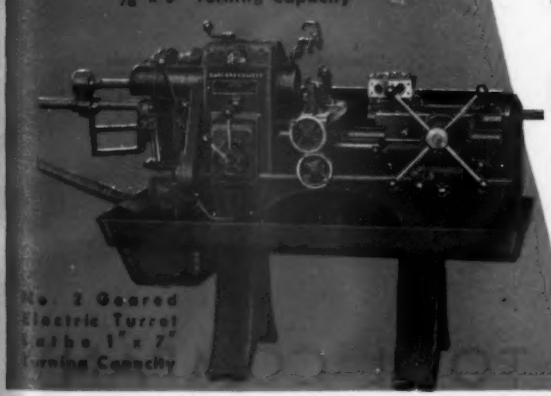
LATHES • RADIALS • SHAPERS

CINCINNATI, OHIO, U. S. A.

Production Time is Saved BY

SELECTING THE DESIRED SPINDLE SPEED QUICKLY AND EASILY

No. 1 Geared Electric Turret Lathe
5/8" x 5" Turning Capacity



No. 2 Geared Electric Turret Lathe 1" x 7" Turning Capacity

Of the twelve speed changes six are obtainable through sliding gears controlled by a single lever. The short lever by the left hand gives an instantaneous high and a low motor speed change. A direct reading dial automatically indicates the spindle speed.

The electrical reverse is exceptionally snappy and responds to a gentle pressure on the lever ball. It saves time when tapping and threading.

Bardons & Oliver Geared Electric Turret Lathes are fast producers of small parts from bars, forgings and castings.

We will gladly furnish complete descriptive matter on request.

BARDONS & OLIVER, INC.
1133 WEST 9TH STREET • CLEVELAND 13, OHIO

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CLOSE ACCURACY

4" TYPE H PLAIN HYDRAULIC GRINDER

"Better Grinding" explains the basic principles of precision grinding. Invaluable for both the operator and the man responsible for grinding. Write for your copy today.

LANDIS TOOL
Precision Grinders

LANDIS TOOL COMPANY

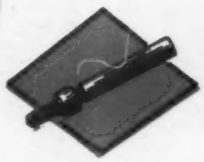
AMERICAN MACHINIST

for Grinding Small Parts

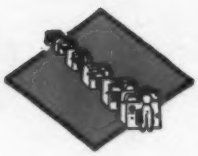
You can grind work within unbelievably close limits if—if cost and time consumed are not taken into consideration. Just as they should be, however, these are the two determining factors.

When accuracy of output is claimed for the Landis 4" Type H, economical production is included. So is the possibility of using operators with limited training. And so is the assurance that results will be consistent day after day, job after job. For full details, write for Catalogue A 44.

The examples of accuracy on these two pages were chosen because they are outstanding. Many parts cannot or need not be ground within such limits.



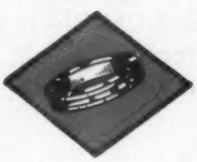
Electrical instrument manufacturer grinds small shafts easily within a limit of plus or minus .00015". Generally speaking, instrument parts are exceedingly small and must be ground within a close degree of accuracy.



Miscellaneous parts manufacturer uses a battery of these machines for straight infeed grinding numerous small pieces. An average limit of .0002" is maintained. Now operators are turning out 1000 pieces in 10 hours, generally without a single scrap piece.

Small instrument manufacturer grinds journals within a limit of .0003", while at the same time holding production at an exceedingly high rate. Two journals of like size at either end of one part are ground by turning the piece end for end with 240 surfaces turned out per hour.

Diesel engine manufacturer uses a number of 4" Type H Grinders for miscellaneous small parts. One machine is equipped for straight infeed grinding a 1⅛" diameter at the rate of 170 pieces per hour compared with the production of 100 pieces per hour on the machine previously used.



Ball bearing manufacturer form grinds the outer raceway of small inner races, holding to a limit of .0002" concentricity and .0005" diameter. Production is 128 per hour. During this operation, which is the finishing operation, .005" stock is removed.

5

LANDIS TOOL Company

WAYNESBORO, PENNA.

PAST PERFORMANCE

...a safe guide for "The Tools You Buy Again"

Actual results — in terms of better, faster, more economical work—make standardization on UNION TOOLS a logical procedure and a sound policy. Years of specialization in development and manufacture has enabled UNION to produce long-lived, dependable small tools — tools that help keep production moving at maximum speed and accuracy at a minimum of expense.

Once you've put UNION tools to work, they'll be the "Tools You Buy Again." Performance will have been the basis for your choice.

UNION TWIST DRILL CO.
Athol, Mass.

STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 5527 Woodward Ave.

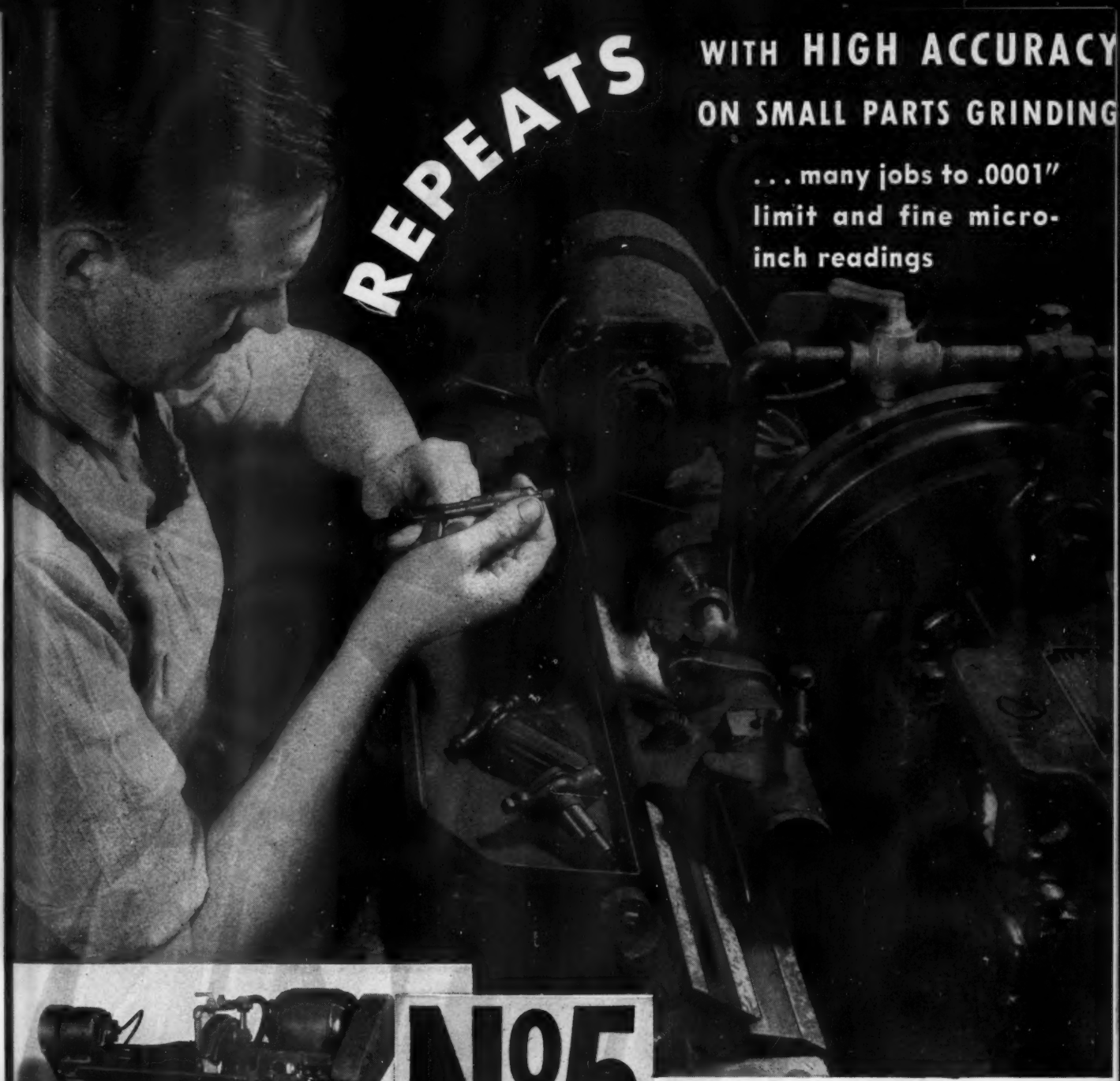
MANUFACTURING DIVISIONS

S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

THE UNION LINE

Twist Drills — Milling Cutters — End Mills — Taps — Dies — Screw Reamers — Hobs — Slitting Saws — Plates—Profile Cutters.

UNION



REPEATS

WITH HIGH ACCURACY ON SMALL PARTS GRINDING

. . . many jobs to .0001" limit and fine micro-inch readings

No 5 PLAIN GRINDING MACHINE

turns work out ACCURATELY . . . and FAST — the result of operating ease and sturdy precision construction. Investigate its advantages for your production grinding of small work to **Close Tolerances.**

BROWN & SHARPE MFG. CO.
PROVIDENCE 1, R. I., U. S. A.

BROWN & SHARPE

DESIGNED FOR

TOMORROW

A

Crankpin Grinder of unique construction and operating cycle . . giving important increases in crankshaft production.

NORTON COMPANY
WORCESTER 6, MASS.

M-486

...and millions like him

BUT KEEP THAT GUARD UP!

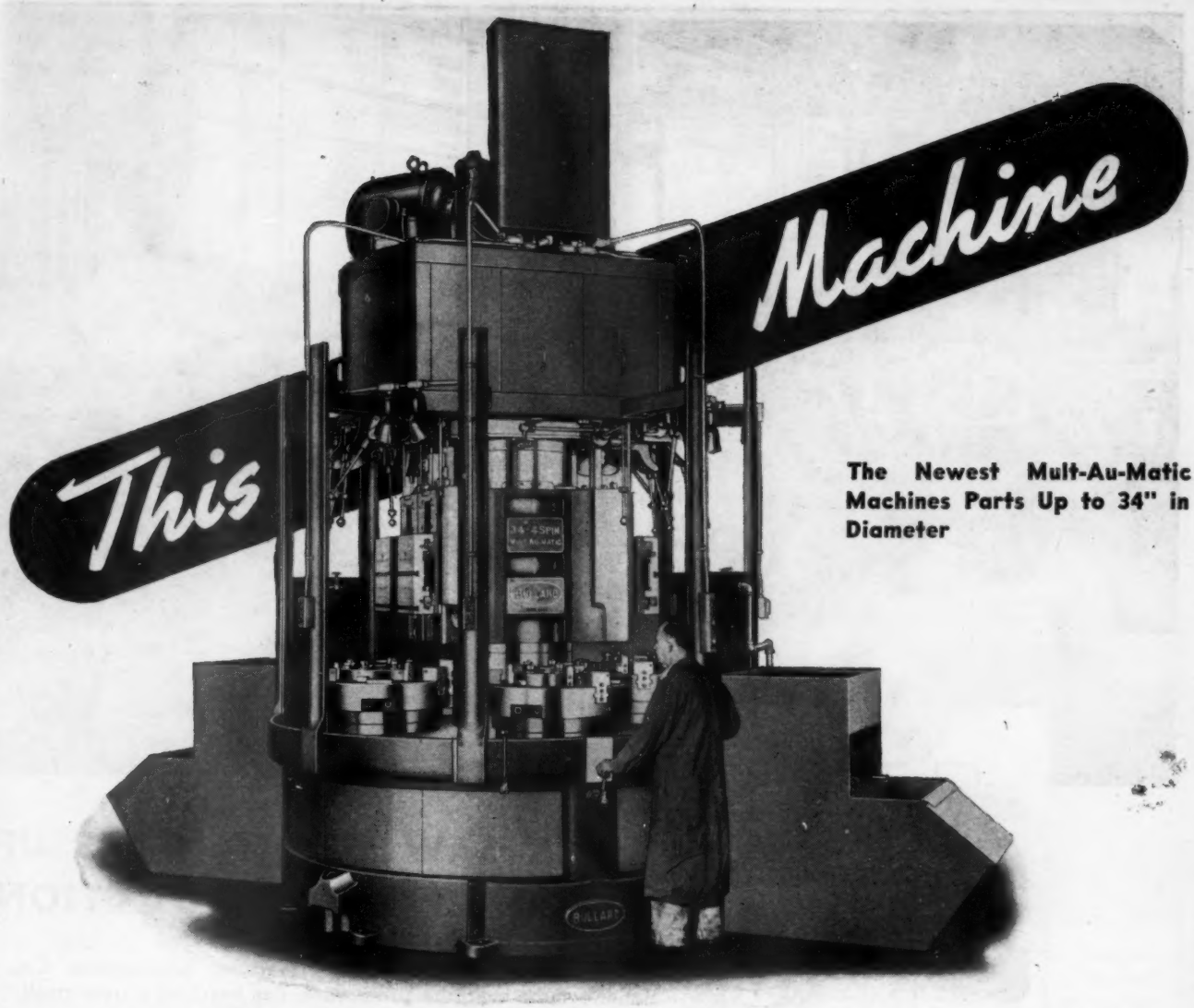
GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION



The Newest Mult-Au-Matic Machines Parts Up to 34" in Diameter

MAKES PRODUCTION HISTORY

Here, in the 34" Mult-Au-Matic, is the long-awaited Bullard answer to the need for extending mass production economy to the manufacture of the larger mechanical parts. This new machine handles parts with diameters as large as 34", heights up to 23."

Think what that means. On scores of operations on smaller parts, the regular Type "D" Mult-Au-Matics have made substantial cuts on production times for the automotive, aviation and similar industries. Now you can apply these same economies to your larger, heavier work as well. For the 34" Mult-Au-Matic offers the same unique advantages:

1. Compound tooling — completes a piece of work in the time required for the longest single cut.
2. Simplified tooling — enables an unskilled worker to operate the machine.

The 34" machine has 4 stations. But since each of the 3 working stations has 2 heads, it accomplishes work formerly done by 6 stations.

Write to-day for booklet — 34 MAM TR — giving complete specifications. Better still, send us blueprints of your work for a time estimate.

Note These Features

Capacity: 34" Swing for a maximum of 23" above top of spindle.

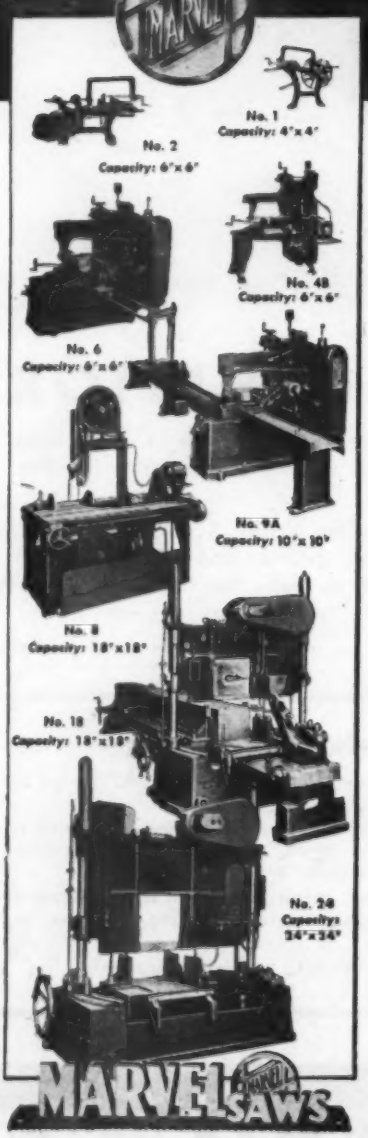
6 heads — 2 at each working station, each with independent feed works, and each providing vertical, horizontal or angular motion.

Adjustable column: permits moving all six tool heads up and down, eliminates tool overhang, increases tool rigidity.

Power operated chucking standard equipment.

THE BULLARD COMPANY

BRIDGEPORT 2, CONNECTICUT



HACK SAW METHOD STEPS UP LOCOMOTIVE PRODUCTION

In the large shops of the American Locomotive Co., at Schenectady, wartime production has reached a new peak.

Among the improved methods contributing to this record output has been the increase in the use of the modern MARVEL Hack Saws for cutting-off even the largest work; for cutting-off car axles, wrist pins and all large forgings — work formerly done with more expensive methods and costlier equipment. One of the first to discover the efficiency and economy of the hack saw method for large work, this company ordered three No. 18 MARVEL Giant Hydraulic Hack Saws soon after these revolutionary Saws were first announced. Today, they are using twenty MARVEL Sawing machines, including eleven of these massive, ruggedly built, giant hydraulics.

MARVEL Saws are increasing the production of war materials in all parts of the country by rapidly, accurately and economically cutting-off the toughest steels in cross sections up to 24" x 24". If you have metal sawing problems, call on the local MARVEL Engineer to recommend methods and equipment.

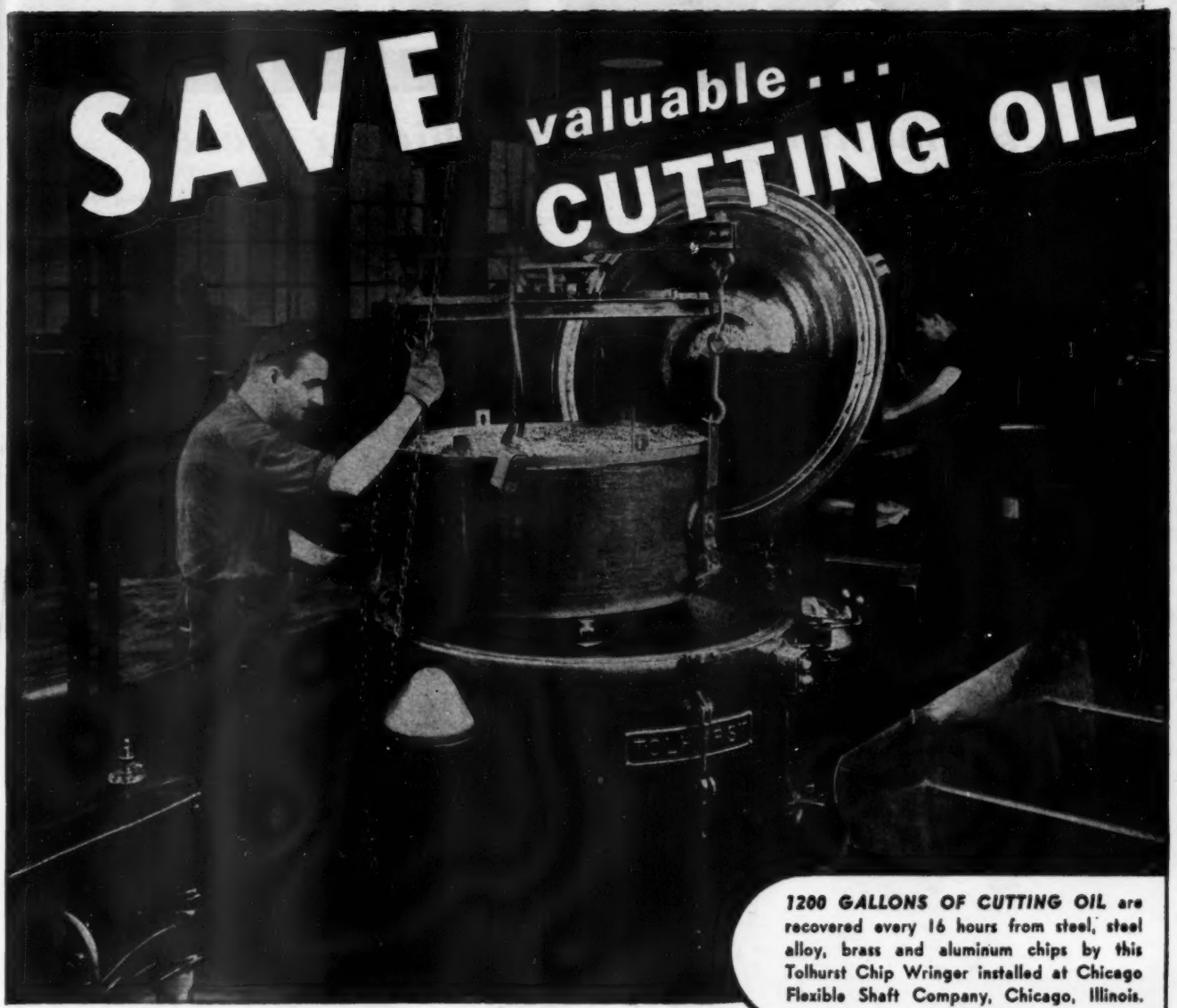
ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 W. BLOOMINGDALE AVE. CHICAGO 39, U.S.A.

Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS



1200 GALLONS OF CUTTING OIL **are recovered every 16 hours from steel, steel alloy, brass and aluminum chips by this Tolhurst Chip Wringer installed at Chicago Flexible Shaft Company, Chicago, Illinois.**

TOLHURST CHIP WRINGERS recover up to 98.6% of valuable cutting oil from metal chips, through the application of *centrifugal force only.* The routine is very simple and unskilled help can efficiently operate Tolhurst Chip Wringers.

REDUCE TOOL WEAR A plentiful daily supply of fresh, reclaimed oil encourages a more conscientious use of cutting oil. Tool room records show reductions in tool wear run as much as 50% after installing Tolhurst equipment. Frequent collection and processing of chips result in cleaner floors and reduce the hazard of fire. Investigate Tolhurst Chip Wringers for conserving cutting oil — reducing tool wear Details gladly sent upon request.

TOLHURST CHIP WRINGERS

TOLHURST CENTRIFUGAL DIVISION • *American Machine and Metals, Inc., East Moline, Illinois*

"Since 1852 — CENTRIFUGAL MAKERS FOR THE PROCESS INDUSTRIES"

POWER...

for multiple cutting and higher speeds

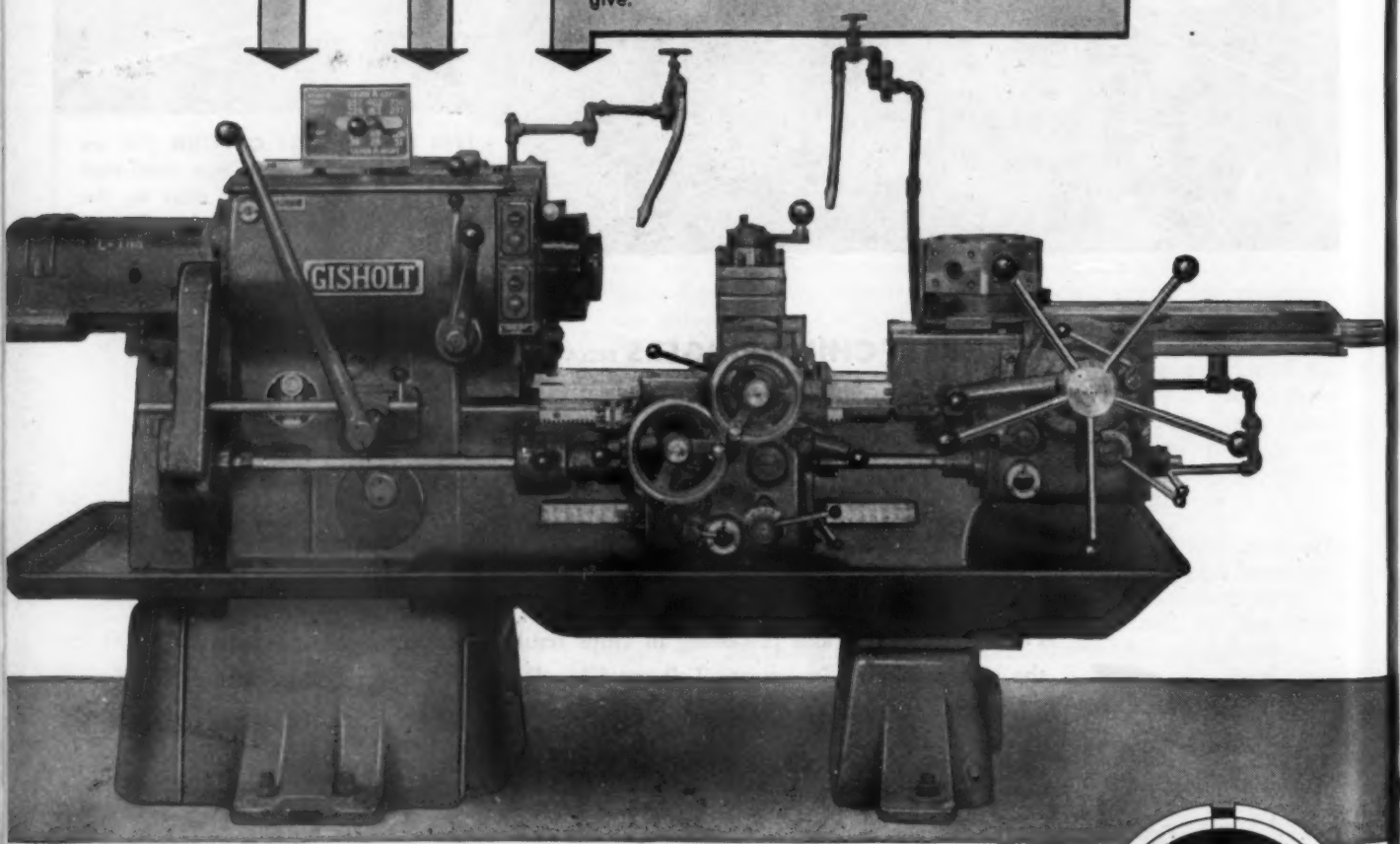
● *Here it is* . . . all the power you'll ever need—and more—for multiple cutting, higher speeds, heavier feeds. With a Gisholt you can work right up to the limit your cutting tools will stand. Don't worry about strain or damage to the machine. These Gisholts are built for it with motors from 50 to 75% more powerful than formerly found on turret lathes of their sizes. And clutches, gearing and bearings are built for it, too.

The demand for multiple cutting and higher cutting speeds with today's tools makes power one of the most important considerations in the purchase of turret lathes. Look for power like this:

A husky multiple disc driving clutch that can take the spindle quickly and smoothly from rest to high speed rotation many times per hour. Powerful enough to drive the spindle against the greatest pressure the cutting tools can withstand.

Beyond the clutch, hardened alloy steel gears are mounted on sturdy shafts and carried on anti-friction bearings. The strength of this headstock is far above any demands that may be put on it in practical use.

A sturdy spindle with flanged nose. Also mounted on anti-friction bearings, this spindle will transmit, without deflection or chatter, an enormous input of power. Bed and tool supports will resist everything that drive can give.



Important as it is in today's production, Gisholt's ample reserve of power means added capacity for years to come. Gisholt engineers will gladly advise you on your own machining problems.

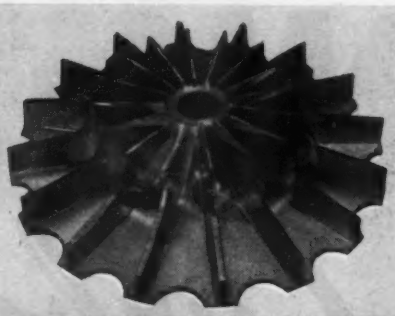
GISHOLT MACHINE COMPANY • *1201 E. Washington Ave., Madison 3, Wis.*

Look Ahead...Keep Ahead...With Gisholt Improvements in Metal Turning

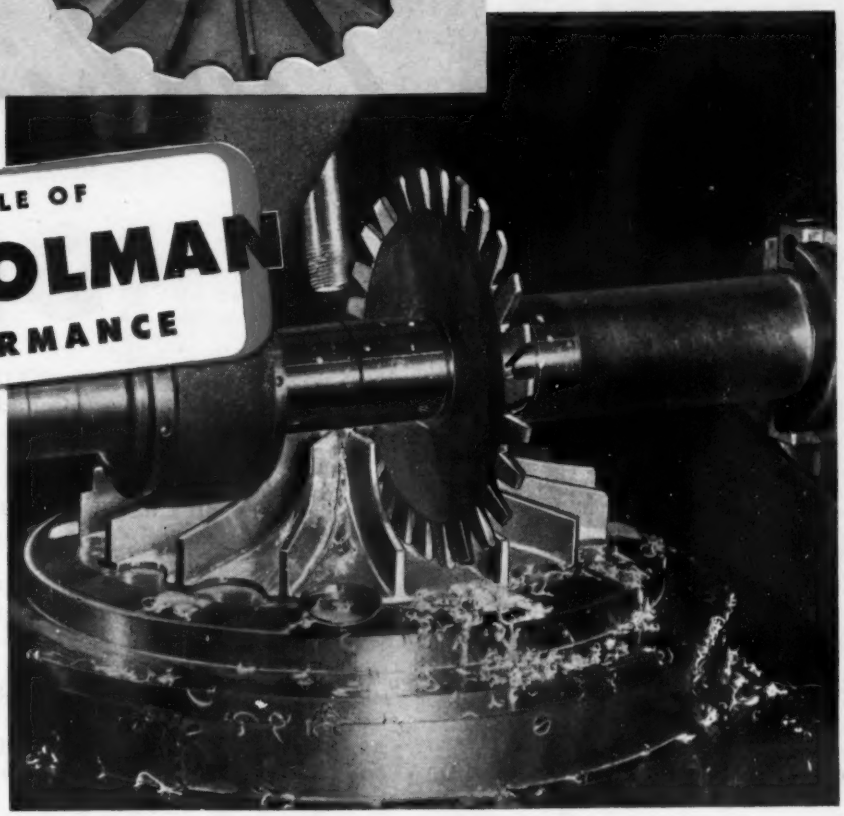
GISHOLT

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES • SPECIAL MACHINES

This shows the finished supercharger impeller for aircraft engines. The sweep milling operation described here follows straddle milling of the fins. The finish obtained on these milling cuts is so fine that only polishing is required.



Production... Accuracy... Finish...



ANOTHER EXAMPLE OF

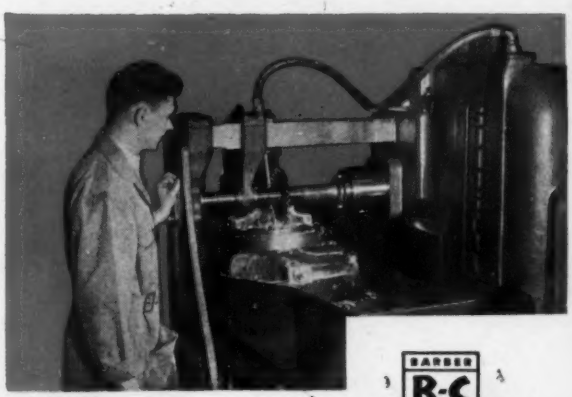
BARBER-COLMAN CUTTER PERFORMANCE

Specially Engineered

CUTTER USED FOR

SWEEP MILLING AIRCRAFT SUPERCHARGER IMPELLER

The problem here was to finish a series of angular surfaces on an aluminum forging, each of which tapered in width toward the hub of the piece. Approximately ¼″ stock was to be removed. Furthermore, a fine finish was required and each surface had to blend smoothly and accurately with a radius at the base of each fin, formed by a preceding straddle milling operation. Barber-Colman engineers, working in conjunction with the machine designers, produced the special cutter shown in action above. The piece is oscillated by the fixture as the feed advances, to produce the sweeping cut; and, because the cut becomes heavier as it nears the hub, the feed is automatically reduced from an initial 8″ to 4″ per min. The cutter, which is 8.242″ dia. and ⅜″ face, is run at a speed of 484 r.p.m. The floor-to-floor time for the complete sweep milling between 16 fins is 14.2 min. per piece. The cutter is profile ground and gives 60 to 75 pieces per grind. *Special cutters by Barber-Colman are demonstrating similar high production efficiency on many difficult jobs.*



Buy War Bonds

BARBER B-C COLMAN PRODUCTS

HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

Barber-Colman Company

GENERAL OFFICES AND PLANT • 111 LOOMIS STREET • ROCKFORD, ILLINOIS, U. S. A.

ARMSTRONG

Carbide

TOOL HOLDERS

ARMSTRONG Carbide TOOL HOLDERS have been specially designed and engineered for use with Carbide-tipped tool bits, and embody the special characteristics essential for the efficient use of carbide-tipped cutters, namely; great strength, extreme rigidity and close-up support for the cutting edge.

The ARMSTRONG Carbide TOOL HOLDERS System makes the use of carbide tools practical for everyday operations in tool rooms, maintenance departments and machine shops. Each takes interchangeable carbide-tipped tool bits ground to different cutter shapes . . . each tipped cutter can be used in a "Straight Right Hand Off-Set" or "Left Hand Off-Set Tool Holders." Hence a small investment in ARMSTRONG Carbide TOOL HOLDERS and carbide-tipped cutter bits can turn those hard-to-do machining operations into "just another routine job," changing losses into profits.

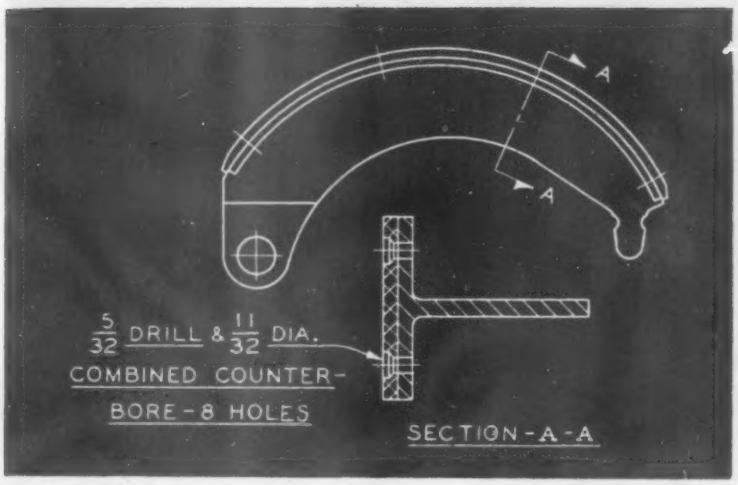
ARMSTRONG Carbide TOOL HOLDERS and Armide or other Carbide-tipped cutter-bits are now available at leading industrial supply houses.

Buy ARMSTRONG TOOLS from your Supply House

Write for Bulletin

ARMSTRONG BROS. TOOL CO. • *"The Tool Holder People"* • **315 N. Francisco Ave., Chicago 12, U.S.A.**

***Eastern Warehouse and Sales Office:* 199 Lafayette St., New York 12, New York**

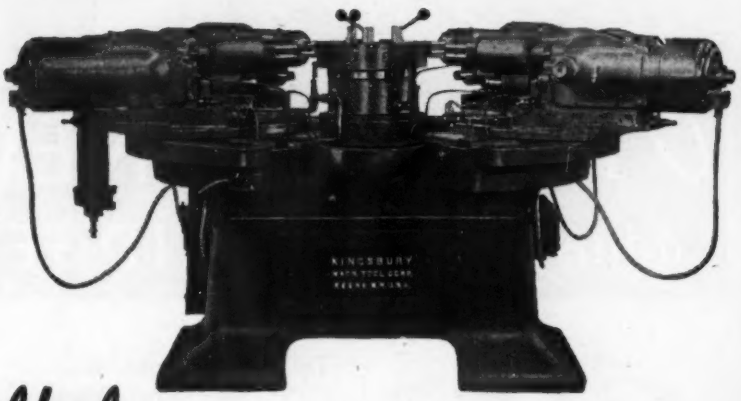


THIS IS A

FLEXIMATIC

AUTOMOTIVE JOB!

Brake Shoe and Lining Production Speedily and Accurately Handled



FLEXIMATIC

by KINGSBURY

One important advantage of the FLEXIMATIC is the fact that it is a machine providing automatic indexing for performing various machining operations in a single chucking of the work.

This method is specifically applied to the Model GD Eight-Spindle Fleximatic arranged for drilling and counterboring brake shoes and linings shown in the accompanying drawing. Many variations of the machine are available, some for lining only and others for shoes only.

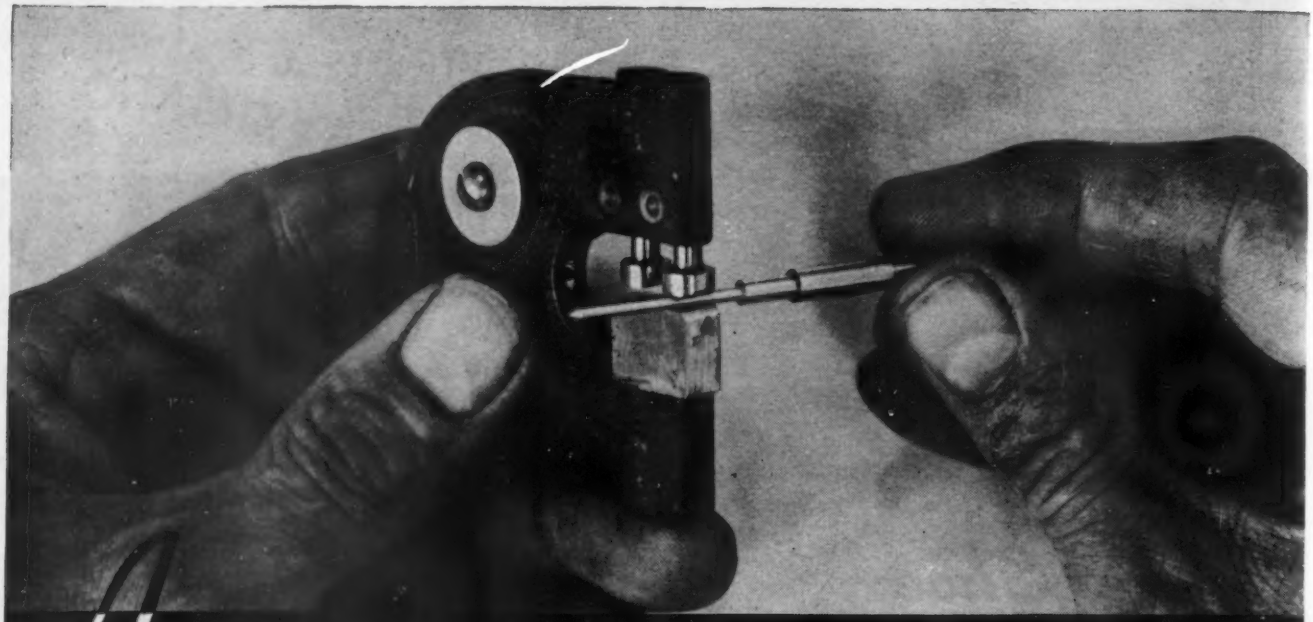
The FLEXIMATIC system pioneered by Kingsbury, involves a single base on which is mounted an indexing turret and standard metal cutting units for each operation such as drilling, reaming, counterboring, etc. The turret is designed to receive a number of duplicate work holding fixtures and can be rotated intermittently under control of the operator for presenting fixtures to loading and working stations. While units are in action, the turret is locked securely. All automatic operations are performed simultaneously while the operator removes a finished part and replaces it with a rough part at the loading station.

Speed, accuracy and easy handling even by unskilled operators are inherent in the performance of FLEXIMATICS.

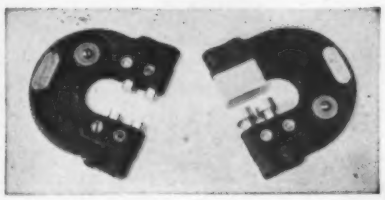
Write today for illustrated Bulletin showing a number of different set-ups

KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A



Announcing the NEW ATLANTIC
adjustable Limit MIDGET TYPE *Snap Gages*



This new model MIDGET TYPE Snap Gage in now in regular production and available for prompt shipment. Made in accordance with American Gage Design—very light in weight—easy to handle—durable. ATLANTIC ADJUSTABLE LIMIT MIDGET TYPE SNAP GAGES are recommended for gaging small and delicate parts, pins, pivots, etc. They are highly accurate.

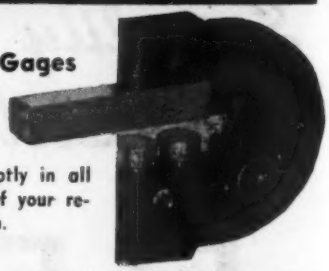
AVAILABLE IN THE FOLLOWING SIZES

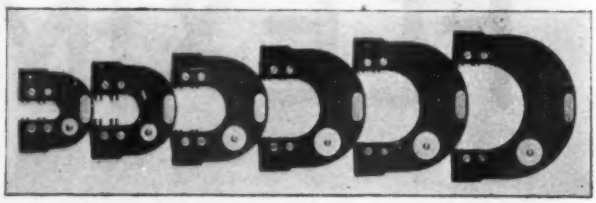
Range .000 — .195"	List Price	$10.40
Range .195 — .385"	List Price	10.40
Range .385 — .570"	List Price	10.80
Range .570 — .760"	List Price	10.80

Write for discount. **ORDER NOW!**

Adjustable Snap Gages with Special Anvils

Can be produced promptly in all varieties. Send prints of your requirements for quotation.





PRODUCTION SETS — Available for prompt delivery. Assure instant inspection. Made in standard sets of from 6 to 19 gages each—from 0 to 6" inclusive. Prices on request.

SEND FOR the complete 48-page SCHERR "LIMITED BUDGET INSPECTION LABORATORY" CATALOG. Sent promptly on request.

GEORGE SCHERR CO.
INCORPORATED
200 LAFAYETTE STREET NEW YORK 13, N. Y.

PUT IN A HUSKIE...FASTER

NEW BEARINGS AND RODS SAVE OUTAGE, MAN-HOURS, MAINTENANCE
A new Worthington line of bearings and connecting rods, now save the continual juggling required by less efficient wedge-adjustable construction. Write for complete details.

New Worthington YC "packaged" unit meets 4 requirements of modern compressor design

No erecting engineer, no special foundations are required when you install this Huskie. It comes packaged for quick installation.

Two-fisted "Y" design gives you these four big advantages:

1. *Higher Speeds.* Vertical Y-frame for perfect balance and higher r.p.m. Rugged construction, for continuous high speed operation.

2. *Ease of Installation.* 75% less foundation space than horizontals of the same capacity. Quick, safe installation — even where subsoil is poor—without special clamps or engineering service.

3. *Accessibility of parts.* Quicker, easier periodic inspections. Large handy openings. Valves outside, for accessibility. Full-floating metallic packing easily reached.

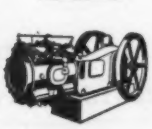
4. *Adaptability to many drives.* Flanged type, synchronous or induction motors, directly mounted on compressor shaft. Easily arranged for Multi-V-Drive or for coupled drive from explosion-proof motor or practically any type of rotative power.

Write for free Bulletin L-667-B1. *Worthington Pump and Machinery Corporation, Harrison, New Jersey.*

WORTHINGTON *BEHIND THE NAME* **WORTHINGTON**

NO OTHER COMPRESSOR WILL OUTPERFORM A WORTHINGTON

Y-types


Horizontal

Vertical

Radial

Portable

Gas Engine Compressors

Stellite THREAD PLUG GAGES WILL CUT YOUR GAGING COSTS!

CADILLAC THREAD GAGES CADILLAC

CUSTOMERS SAY:

"5 to 20 times the wear of best steel gages"

If you have a job that is tough on gages, give STELLITE Gages a try!

Developed by Cadillac, and tested in customers' plants on hundreds of jobs during the past three years, gaging threads in precision parts of highly abrasive materials, Stellite Gages have consistently given 5 to 20 times longer service than the steel gages formerly used on the jobs.

You will find that Cadillac STELLITE Gages meet the same high standards of quality and superfine tolerances to which you have been accustomed in Cadillac steel thread gages. Give them a trial and see how they will cut your gaging costs! All sizes from No. 6 to 15" in diameter.

CADILLAC *Thread* GAGES

CADILLAC GAGE COMPANY

20316 Hoover Rd. Detroit 5, Mich.

The CONE AUTOMATIC MACHINE COMPANY sees many GOOD THINGS AHEAD

It is reported that . . . . . .

A recently patented heating plate has two elements from which four degrees of heat may be obtained by using them singly or in combination as well as in series or parallel.

get ready with CONE for tomorrow

A new patent covers the use of perforated plates at the bow of a small, fast motorboat which permits the hull to ride on a cushion of foam.

get ready with CONE for tomorrow

Spraying the interior of a freight car or truck with dry ice is being tried as an inexpensive method of refrigeration.

get ready with CONE for tomorrow

Serious consideration is being given to the making of illuminating gas near the coal mines and its delivery by pipe line.

get ready with CONE for tomorrow

Cigarette paper, formerly a French monopoly, is now being successfully made in this country.

get ready with CONE for tomorrow

A capsule has been developed that is said to be effective in the prevention of seasickness in about 75% of the cases tested.

get ready with CONE for tomorrow

Cloth is being made from shredded redwood bark mixed with wool.

get ready with CONE for tomorrow

Experiments are being made to determine the suitability of animal blood for human transfusion.

get ready with CONE for tomorrow

Shafts for generators are now being squeezed into shape with dies.

get ready with CONE for tomorrow

A new plant processes 25,000 pounds of milkweed floss per day.

Shoal draft boats with tunnel sterns are made more efficient by the use of a small stand-pipe over the propeller which is kept full of water by a vacuum pump. The propeller is thus constantly surrounded by water although above the water level.

get ready with CONE for tomorrow

Anthropology is not popularly thought of as a commercially useful science, but anthropologists were consulted in designing seats for aircraft, gas masks, and goggles, and they might well be turned loose on the problems of private and public furniture after the war.

get ready with CONE for tomorrow

Airplane propellers are now being made of sponge rubber over a metal core.

Apparatus now in use by our army is expected to make it possible for civilians to forecast weather accurately as much as 24 hours ahead.

get ready with CONE for tomorrow

One of the country's largest chemical companies states that 46% of its gross sales for last year consisted of products unheard of fifteen years ago.

get ready with CONE for tomorrow

Rayon is being used for tire cord, parachutes, paint brushes, pump packing, bullet-proof gas tanks, lint-free gloves, electrical insulation, gas-proof clothing, cartridge bags, felt, and rugs.

get ready with CONE for tomorrow

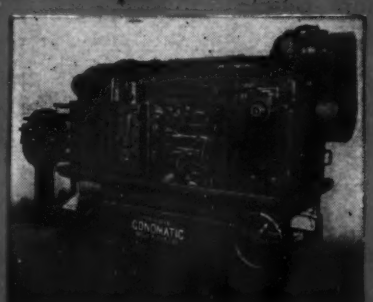
Optimistic producers of synthetic rubber say that, in the future, people will buy new automobiles to go with their old tires.

get ready with CONE for tomorrow

Ball bearings are now being made small enough to replace the jewels used in many precision instruments.

Tomorrow's production should eliminate second operations

The 8-Spindle Conomatic produces these wheel hub bolts from SAE 1030 in 34 seconds each. Slot milling in the large diameter and stamping the letter on the end are done without stopping the spindle. Conomatics reduce costs, save time, and eliminate second operations.



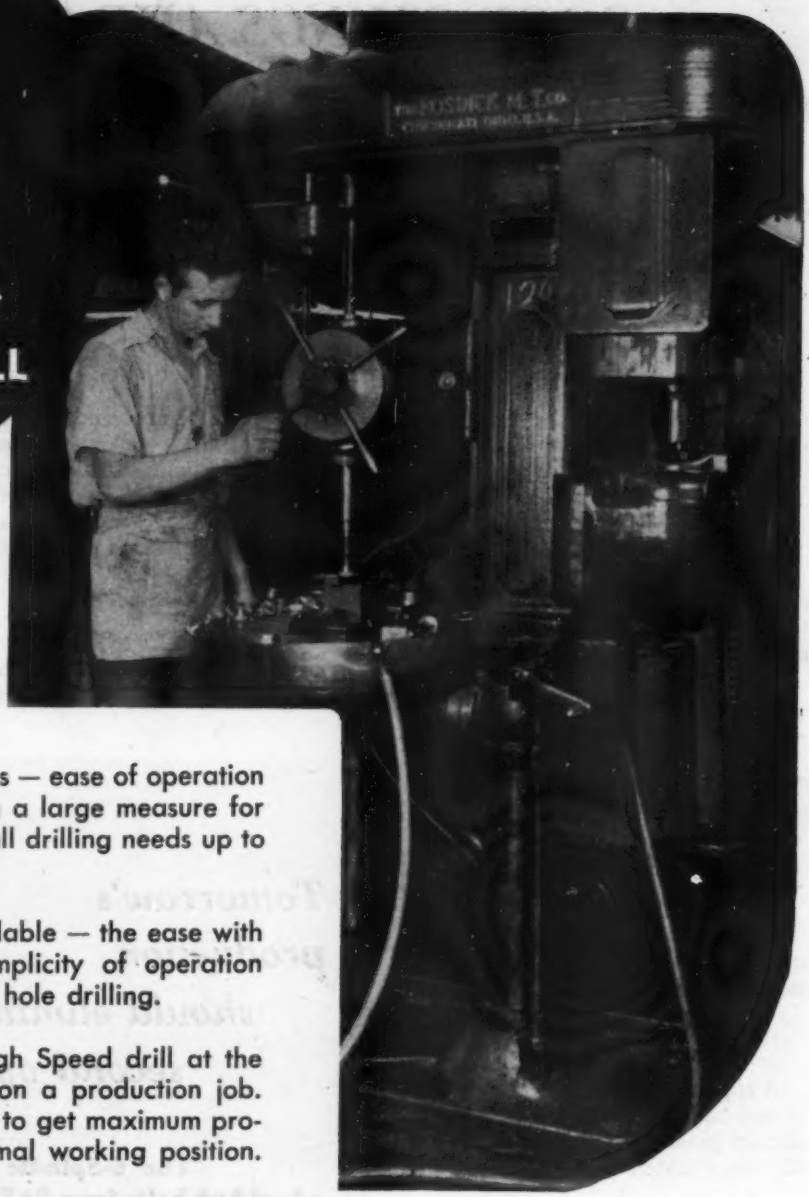
CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U. S. A.

10

Fosdick

HIGH SPEED DRILL



MEETS HIGH PRODUCTION AND PRECISION DEMANDS

● The simplicity of design — compactness — ease of operation — and rigidity of construction account in a large measure for the growing acceptance of this drill for all drilling needs up to 1¼ inches.

The unusually wide range of speeds available — the ease with which they can be changed — the simplicity of operation makes this sturdy drill popular for small hole drilling.

Illustrated is a single spindle Fosdick High Speed drill at the Evans Products Co. drilling small holes on a production job. The high speed spindle enables operator to get maximum production with minimum effort from a normal working position.

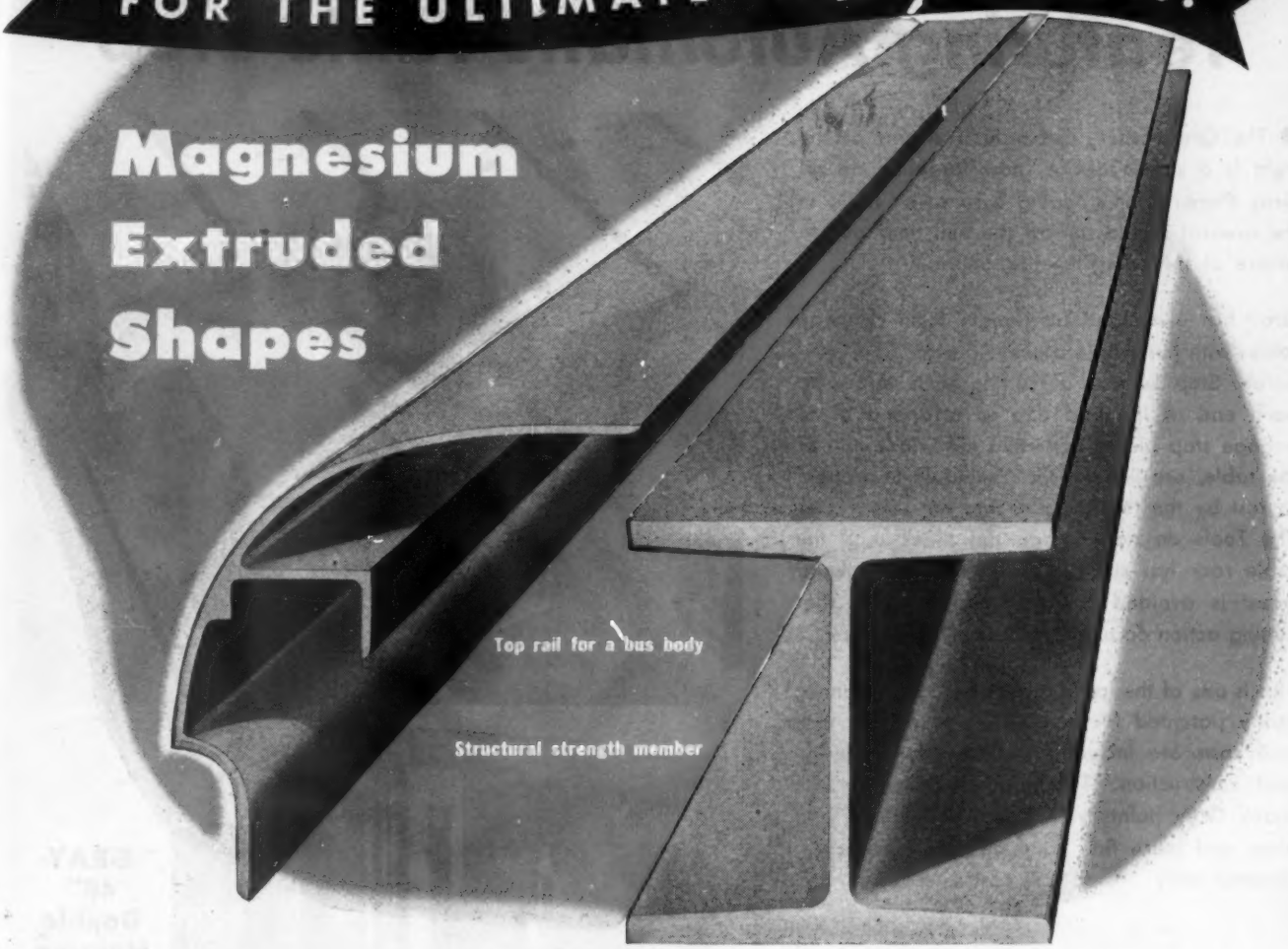
The machine is also furnished in multiple spindles up to six with various spindles having power feed, hand feed or tapping attachment. Normal distance between spindles on all multiple machines 12 inches center to center. Machine may also be furnished with two spindles and four spindle table, lower column and base with center distance on spindles anywhere from 12 inches to 36 inches.

Complete information on various combinations contained in Fosdick High Speed Drill Bulletin H.S.A. Write for your copy today.

FOSDICK MACHINE TOOL COMPANY
CINCINNATI 23, ··· OHIO

FOR THE ULTIMATE IN *Lightness..*

Magnesium Extruded Shapes



Couple the extrusion method of manufacture with the natural lightness and high strength of magnesium for a weight-saving combination that's hard to beat. Magnesium extruded shapes let you achieve the ultimate in lightness with safety and economy.

In extruded magnesium shapes, the metal can be placed exactly where needed. No wasteful, weight-adding excess to satisfy the limitations of a manufacturing method. Note how the bus top-rail section pictured above provides for its own assembly into the structure and for addition of top and side sheets. The necessity for building up sections by riveting or welding is avoided.

Magnesium extruded shapes and other products are now available through American Magnesium Corporation for purposes authorized by W.P.B. Our representatives will gladly assist you in meeting your requirements. Aluminum Company of America (Sales Agent for American Magnesium Corporation) 1709 Gulf Building, Pittsburgh 19, Pennsylvania.

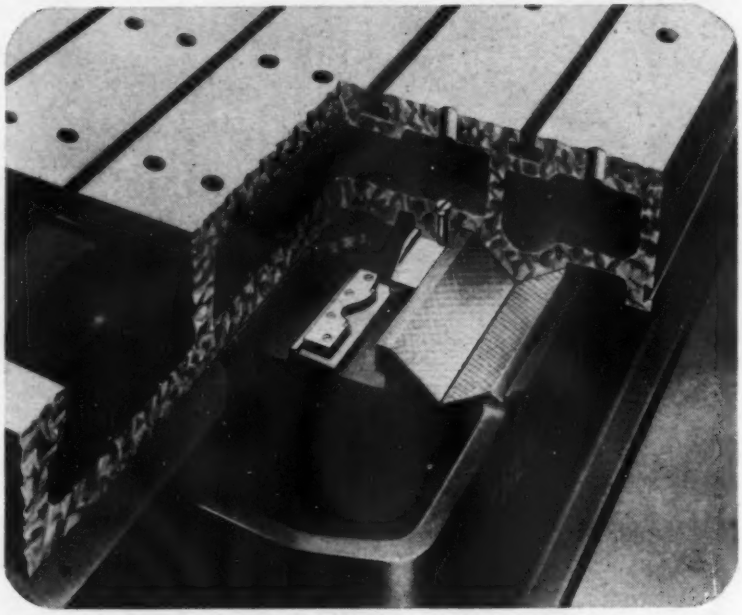
MAGNESIUM MAZLO PRODUCTS

AMERICAN MAGNESIUM CORPORATION

SUBSIDIARY OF ALUMINUM COMPANY OF AMERICA

GRAY *Double Housing* PLANER
featuring Automatic Table Stop

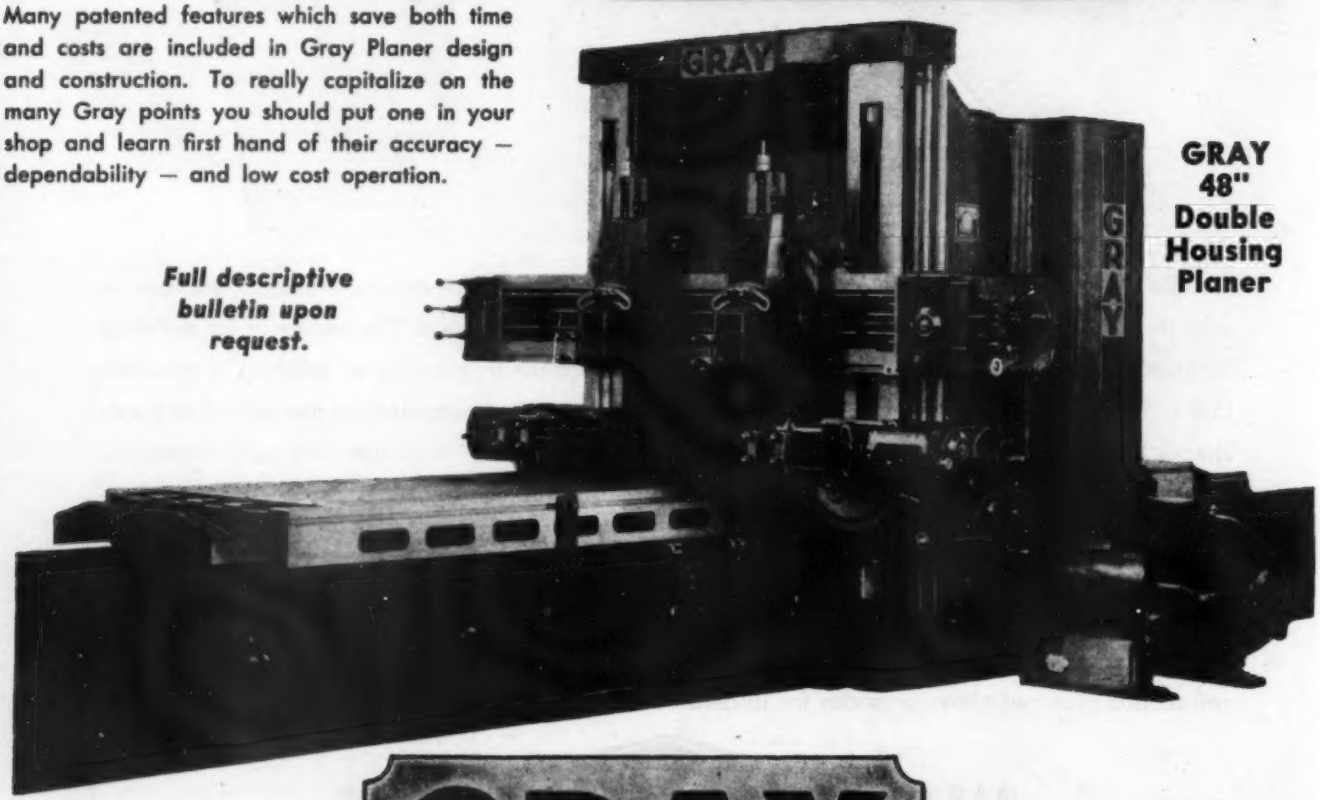
● The Gray Safety Table Stop shown at the right is a simple device, now furnished on all Gray Planers, for stopping a runaway table in the event it should run off the bull gear due to failure of the reversing mechanism.



Gray has eliminated all danger from runaway tables with this simple braking device. The Gray Safety Stop consists of cutting tools bolted to each end of the bed and so arranged as to engage stop blocks bolted to the under side of the table, see illustration. The table is brought to rest by the tools cutting into the stop block. The Tools do not engage the block until the table rack has run off the bull gear. Upward thrust is avoided by arranging tools so that cutting action occurs on the side of the block.

This is one of the latest features of Gray Planers. Many patented features which save both time and costs are included in Gray Planer design and construction. To really capitalize on the many Gray points you should put one in your shop and learn first hand of their accuracy — dependability — and low cost operation.

Full descriptive bulletin upon request.

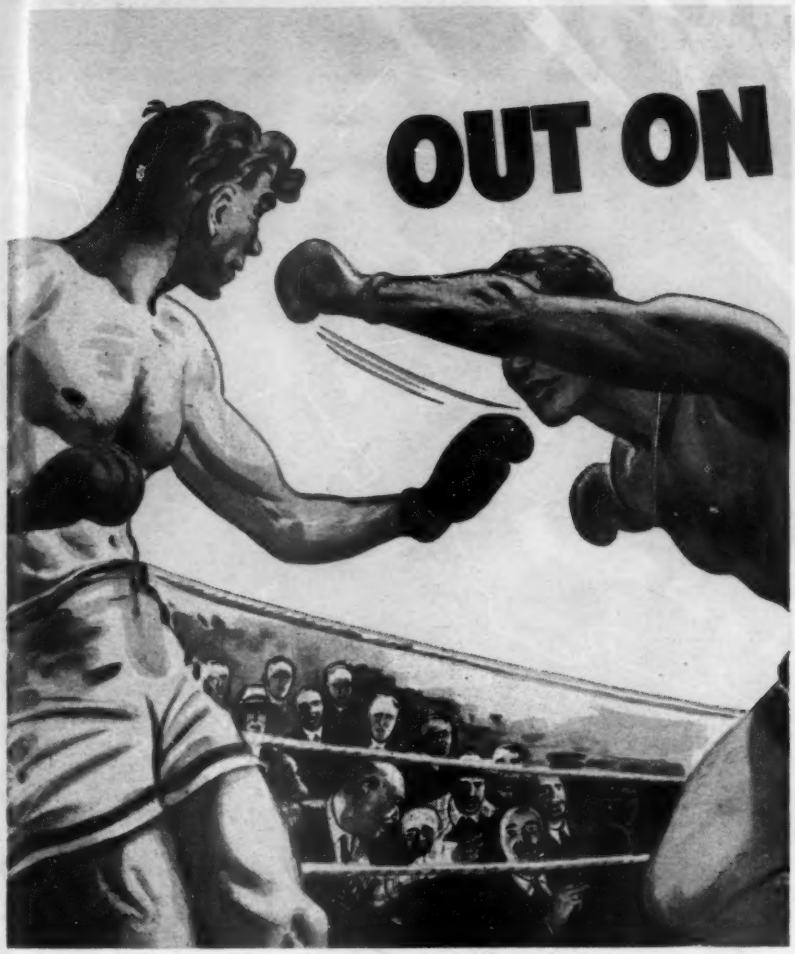


GRAY 48" Double Housing Planer

GRAY

THE G. A. GRAY COMPANY
Cincinnati 7 Ohio, U.S.A.

THE GRAY LINE — Double Housing and Openside Planers, Switch Planers, Die Block Planers, Double-Housing and Openside Milling Planers, Planer Type Milling Machines, Horizontal Boring Machines



OUT ON HIS FEET

And so is that old lathe in your plant. Of course it can still run, still produce, — BUT HOW?

Its percentage of scrap runs pretty high; time has to be taken out for frequent readjustments; the operations it can do are limited; it is hard to operate; its undependable performance plays the devil with fine tolerances and drives the blameless operator almost to distraction. It's a mechanical "slow down striker" on your production line. You're money ahead to toss in the towel and get a brand new lathe.

Get a lathe that turns at a profit as it trues your product . . . a lathe that when it's set, IS SET and turns out the work better and faster. Get one that is easy to operate . . . one whose range and variety of operations make it a machine tool of outstanding versatility. Get a New LeBlond Lathe.

LeBlond is building tomorrow's lathes today. They'll help you meet tomorrow's greater, keener competition with confidence. Write for catalog.

THE R. K. LeBLOND MACHINE TOOL CO., CINCINNATI 8, OHIO, U. S. A.

NEW YORK 13, 103 Lafayette St., CAnal 6-5281
CHICAGO 6, 20 N. Wacker Dr., STA 5561

★ YOUR BONDS BUY BOMBS ★
BUY A "BLOCK-BUSTER" TODAY!

ARMY E NAVY

time to retool
Turn to LeBlond for Turning Equipment

Check-Clip-Mail

FOR ILLUSTRATED SPECIFICATIONS

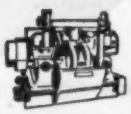
- ☐ HEAVY DUTY GEARED HEAD ENGINE LATHES
- ☐ HEAVY DUTY GEARED HEAD GAP LATHES
- ☐ TOOL ROOM LATHES
- ☐ RAPID PRODUCTION LATHES
- ☐ AUTOMATIC LATHES
- ☐ AUTOMATIC CRANKSHAFT LATHES
- ☐ SUPER REGAL GEARED HEAD LATHES
- ☐ No. 2 CUTTER GRINDER

YOUR NAME _____ TITLE _____
YOUR FIRM _____ ADDRESS _____

HD Engine Lathes—Nine sizes ranging from 12" to 50" swings. For versatility in turning.

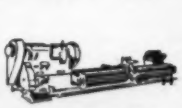
Automatic Lathes—12" & 16". Mechanical or Hydraulic power.

Super Regal Lathes—Six sizes, 13" to 24". Best for training.

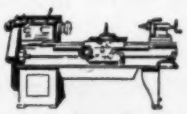


Automatic Crankshaft Lathes—For all facing, turning, finishing, pins.

Tool Room Lathes—12", 14", 16" and 18" swings. Versatile.



HD Gap Lathes—Ten sizes in Regular and Sliding Gap models.



Rapid Production Lathes—13", 17", 20" swings. Six speeds. Faster output. Lower cost.

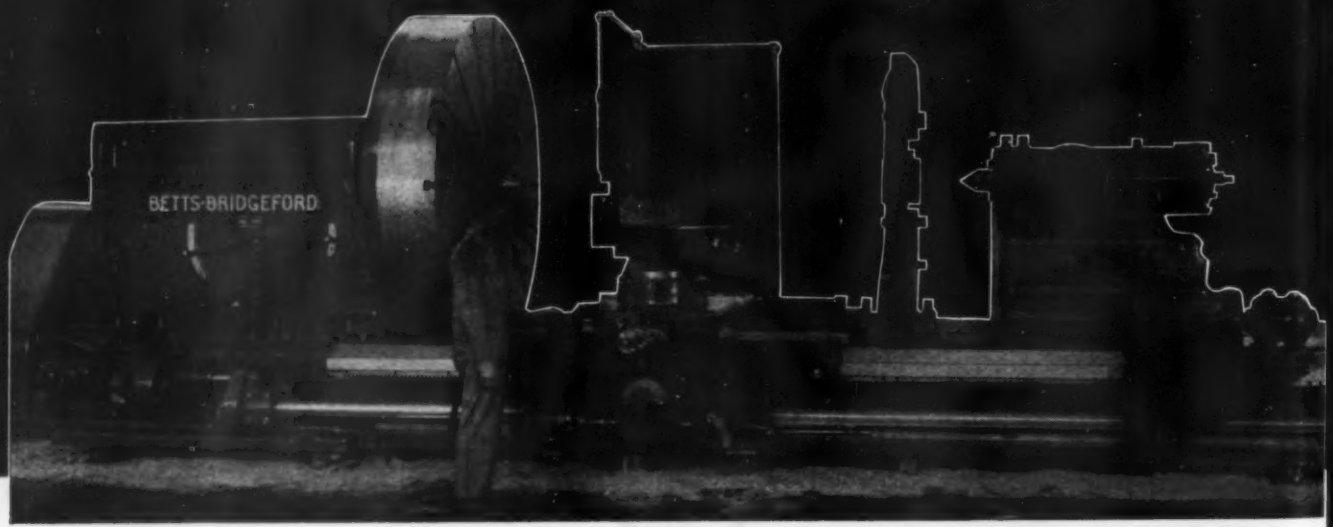
No. 2 Cutter Grinder—Internal, cylindrical, face and angular work.

LARGEST MANUFACTURER OF A COMPLETE LINE OF LATHES

Chips!

BIG CHIPS *from* BIG MACHINES

. . . . as they pile up from CONSOLIDATED Machines, chips like these mean more and better weapons for our Fighting Men.



Since 1922, CONSOLIDATED has specialized in building heavy machine tools . . . and for many years prior, the individual companies which combined to form CONSOLIDATED were recognized leaders in the heavy machine tool industry.

As CONSOLIDATED Machine Tools are meeting today's war-stimulated demands for heavy duty machines, so will they be ready for the coming peace-time needs of the mass production and heavy industry fields.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

CONSOLIDATED MACHINE TOOLS

CONSOLIDATED
MACHINE TOOL CORPORATION

ROCHESTER 10, NEW YORK

"Put it on the Blanchard"

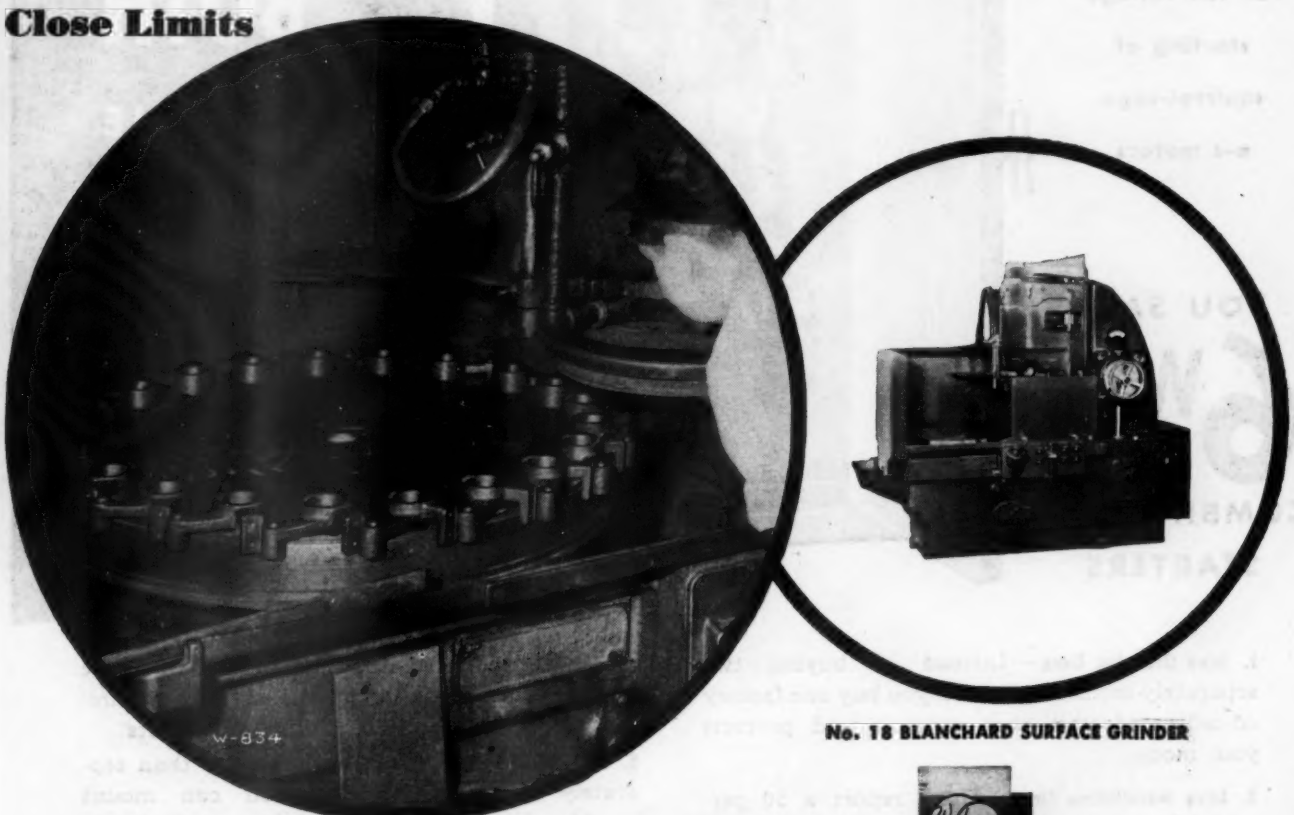
...GET THESE ADVANTAGES

Production ✓
Adaptability ✓
Fixture Saving ✓
Operation Saving
Material Saving
Fine Finish
Flatness
Close Limits

Grinding Pawl Arms

These are cast iron pawl arms with projecting bosses on one side at the ends of the arms. They are held on the 36" chuck of a No. 18 Blanchard Grinder with the projecting bosses extending down outside the chuck.

Twenty-one pieces are placed on the chuck at one time and two loads or thirty-two pieces are ground per hour, removing 3/16" of metal.



No. 18 BLANCHARD SURFACE GRINDER

Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BLANCHARD

The BLANCHARD MACHINE COMPANY
64 STATE STREET, CAMBRIDGE 39, MASS., U. S. A.

MOTOR STARTERS EVERY TYPE,

DEPENDABLE . . . ATTRACTIVE IN APPEARANCE

For full-voltage starting of squirrel-cage a-c motors

YOU SAVE 6 WAYS WITH COMBINATION STARTERS

1. Save Ordering Time—Instead of buying two separately mounted devices, you buy one factory co-ordinated unit that controls and protects your motor.

2. Save Installation Time—Users report a 50 per-cent reduction in mounting time, a 40 per-cent reduction in wiring time, as compared with the installation of two separate devices. You connect only 9 terminals—not 15.

3. Save Man Power—By eliminating one complete mounting job on every installation, you save valuable man power.

4. Save Money—Cost slightly more than two separately mounted devices, but the difference is more than made up by the savings in wire, conduit, fittings, and installation-labor costs.

5. Save Wall Space—Take up less space than separately mounted devices. You can mount combination starters in small, unused spaces near the operators.

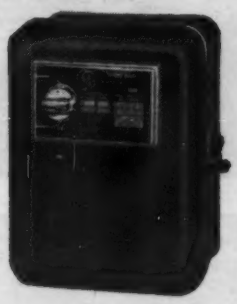
6. Save Critical Materials—Combination starters have less copper wire, steel conduit, and fittings than separately mounted devices

—and they save your motors, too. The fuses, or the breaker, are co-ordinated with the thermal overload relays to give complete motor protection under short-circuit or overload conditions.

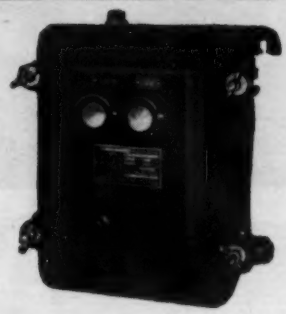
EVERY KIND, FOR EVERY MACHINE APPLICATION

DESIGNED TO BLEND WITH MODERN MACHINES

Magnetic Full-voltage Starter—Designed to provide long life, ease of installation, readily accessible parts for quick inspection, and the dependability requisite to modern industrial needs.

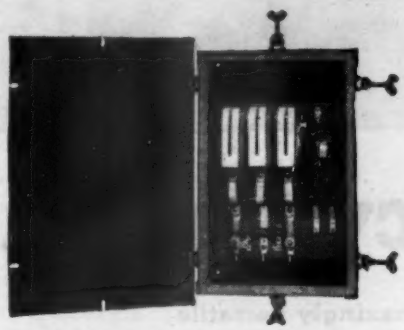


Magnetic Full-voltage Starter—Showing START-STOP push button mounted in the cover of a general-purpose case.

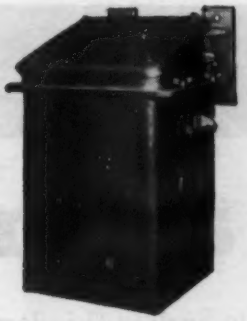


A-c Magnetic Starter with Watertight Case—Wall-mounted, overload-relay reset button in cover, and push button can be added.

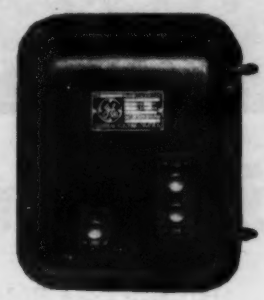
Starter with Dust-tight Case—Fabricated, case of cold-rolled sheet steel—wall-mounted—overload-relay reset button in cover.



Starter for Hazardous Locations—Will withstand internal explosion—high tensile cast iron will meet hydrostatic pressure test—overload-relay reset button in cover.



Oil-immersed General-purpose Starter—Suitable for use in corrosive atmospheres found in such places as chemical plants and oil refineries, or for outdoor use.



NAME YOUR APPLICATION

G-E starters come in a variety of enclosures to meet any operating condition, and are available for motors from 1 to 1000 horsepower. Write today for further information about these starters—our engineers will be glad to help you select the correct type for your needs. *General Electric Company, Schenectady 5, N. Y.*

INDUSTRIAL CONTROL

GENERAL ELECTRIC

BUY WAR BONDS

Grinding SMALL parts

or HEAVY pieces

with equal accuracy and ease

HILL "Open Side" Hydraulic Surface Grinders are amazingly versatile on production work and final finishing operations where surface accuracy must be maintained within very close limits. HILL "Open Side" design affords maximum accessibility to the work and the fully hydraulic table and cross feeds insure smooth, positive operation. HILL "Open Side" Horizontal Spindle Hydraulic Surface Grinders are built in table widths of 18", 24", 30" and 36". Standard table lengths range from 5 to 20 feet. Bulletin 844 gives complete details of operation.

Also Built in Vertical Spindle Design

The HILL ACME Co.

6400 BREAKWATER AVE • CLEVELAND, OHIO

MID-WEST Super-Cut WHEELS

IN YOUR GRINDING ROOM

Mean Better, More Economical Tool Sharpening

The tool grinding room equipped with MID-WEST SUPER-CUT grinding wheels is well prepared for *any* type of high-speed steel-sharpening job.

Made with our No. 2 grain (Special Aluminum Oxide) MID-WEST SUPER-CUT wheels are exceptionally cool cutting, virtually eliminating all danger of over-heating costly tools. They also cut remarkably fast and are *efficiently serviceable* much longer than most wheels of their type. Hence they are more economical.

Ask our local service engineer how MID-WEST SUPER-CUT wheels can reduce your grinding room costs.

MID-WEST ABRASIVE COMPANY

Manufacturers of Dependable Abrasives

Owosso, Mich. — 1960 EAST MILWAUKEE AVENUE, DETROIT 11, MICHIGAN — Rochester, Pa.

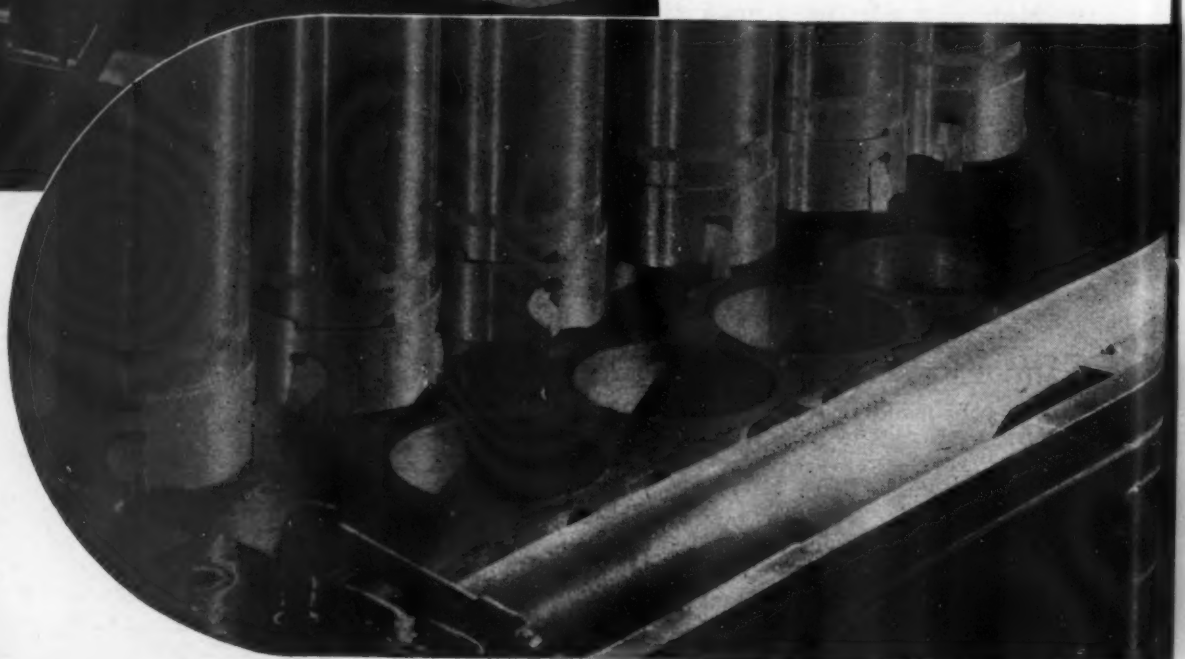
INGERSOLL

Precision
CYLINDER BORING

● Here is a modern cylinder boring machine embodying features developed in twenty years of intensive study in boring. The machine is driven by a 50 H.P. motor and bores six holes, each of which is eleven inches long, requiring the minimum amount of stock to be taken out in honing.

● The machine is equipped with a patented Ingersoll precision spindle which permits faster accurate boring than can be done with piloted bars. This spindle has a record of increased production in many shops throughout the country. Its use is not limited to cylinder boring alone but may be applied to other mass production boring.

● The machine and equipment are illustrative of Ingersoll engineering which made it possible to design and furnish the machine complete with fixtures, cutters and tools, ready to go into operation at a guaranteed rate.



Send for Booklet . . . "Examples of Specialized Boring Machines"

THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILL.

. . . help sustain high production, and precision

Kennametal centers outlast high speed steel centers 50 to 100 times, because the nib is made of special, very hard, non-galling grade of carbide. Increased production rates can thus be sustained—jobs keep turning on Kennametal centers, while steel centers are being removed for grinding many times—40, 50, or even 100.

Chatter due to center wear is eliminated and accurate machining thereby maintained. Costs are reduced—fewer centers need to be reground—less idle time of machine and operator for replacements.

The unique ability of Kennametal centers to keep work running true makes them well suited for precision jobs on grinders, and, when teamed with Kennametal lathe tools, they help to assure such accurate turning that grinding operations can often be eliminated.

Kennametal centers are stocked in standard sizes—Morse, Brown & Sharpe, and Jarno tapers. Separate, accurately molded nibs are available for those who wish to make their own centers. Catalog 44 describes them. A copy is yours for the asking.

KENNAMETAL

SUPERIOR CEMENTED CARBIDES

TRADE MARK REG. U. S. PAT. OFF.

KENNAMETAL *Inc.*, LATROBE, PA.

Let's Talk About BETTER, SAFER *Surface Grinding*

Sterling No. 2 Patented Chucks and Segments, used together, form a carefully designed, thoroughly tested surface grinding unit that saves time and money, does a better job, and makes more certain the safety of the operator.

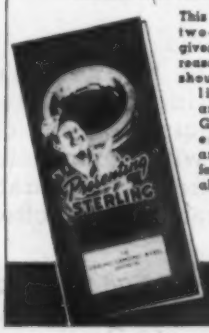
The ring of separately mounted segments in a Sterling No. 2 Chuck provides a continuous shearing action that means better, faster grinding and longer lasting segments. Strict control of the abrasive structure means pre-determined results from every segment you use.

Because Sterling Segments are not gap-type, there are no dangerously wide areas between them . . their interlocking design permits only a very thin, minute space that provides cooler grinding. This patented, interlocking design also adds greater strength and results in smoother operation and better finish.

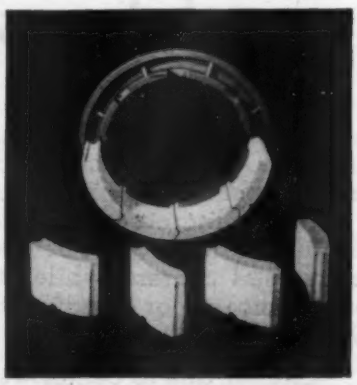
Sterling Segments cannot wobble . . the more they wear down, the more rigid their seat in the chuck becomes. Though Sterling Segments are rigidly held in the chuck, it is the work of a moment to loosen them for replacement.

Ask a Sterling engineer for a full explanation of the many features that will make your jobs easier and more profitable. He is equipped by years of experience to recommend what you need. Write!

SEND FOR THIS FOLDER ON STERLING CHUCKS AND SEGMENTS



This twelve page, two-color folder gives many good reasons why you should use Sterling Chucks and Segments. Gives all necessary data and drawings for ordering also prices!

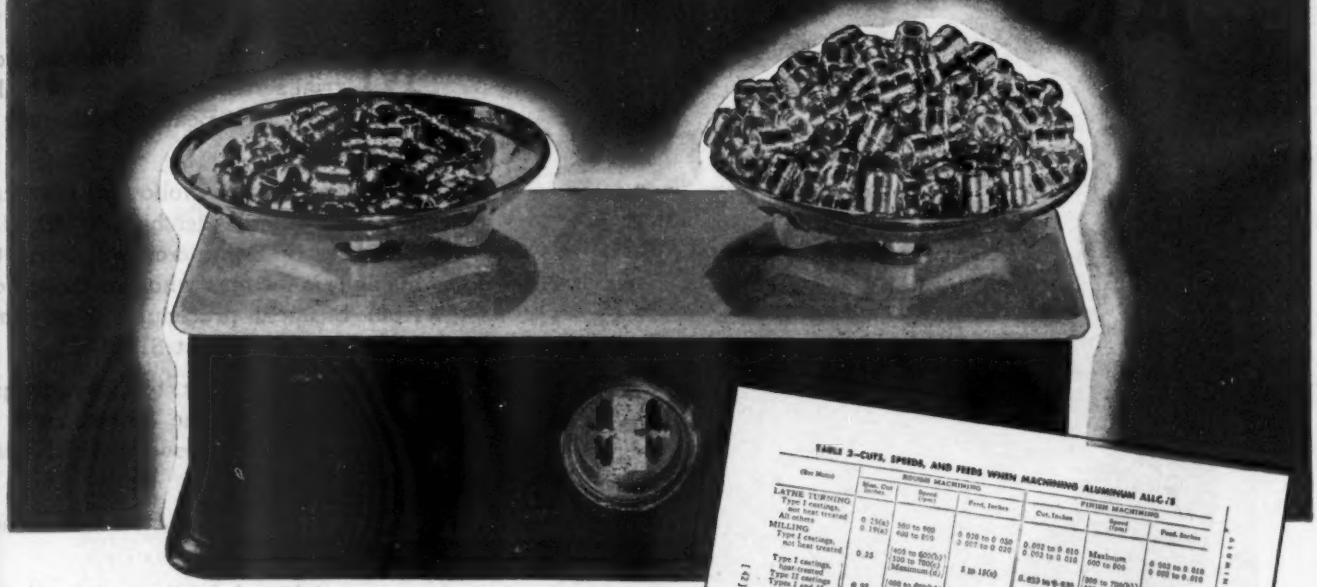


• STERLING ABRASIVES •

THE
STERLING GRINDING WHEEL DIVISION
OF THE CLEVELAND QUARRIES COMPANY
TIFFIN, OHIO

THE WHEELS OF INDUSTRY

Remember, with aluminum, you get three times as many pieces per pound



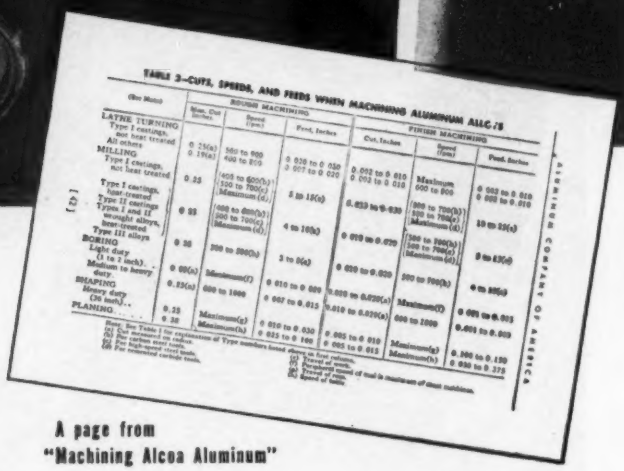


TABLE 2—CUTS, SPEEDS, AND FEEDS WHEN MACHINING ALUMINUM ALLOYS

(See Note)	ROUGH MACHINING			FINISH MACHINING		
	Nom. Cut (inches)	Speed (fpm)	Feed, Inches	Cut, Inches	Speed (fpm)	Feed, Inches
LATHE TURNING						
Type I castings, not heat treated	0.25(a)	500 to 900	0.020 to 0.050	0.005 to 0.010	Maximum	0.002 to 0.010
All others	0.19(a)	600 to 800	0.007 to 0.020	0.002 to 0.010	600 to 800	0.005 to 0.010
MILLING						
Type I castings, not heat treated	0.25	400 to 600(b) 500 to 700(c) Maximum(d)	2 to 15(e)	0.010 to 0.020	500 to 700(b) 600 to 800(c) Maximum(d)	10 to 25(e)
Type I castings, heat-treated	0.25	400 to 600(b) 500 to 700(c) Maximum(d)	4 to 10(b)	0.010 to 0.020		
Type II castings					500 to 700(b) 600 to 800(c) Maximum(d)	5 to 15(e)
Type I and II wrought alloys, heat-treated	0.25	200 to 500(b)	3 to 5(e)	0.020 to 0.030	200 to 700(b)	4 to 10(e)
Type III alloys	0.05(a)	Maximum(f)	0.010 to 0.020	0.020 to 0.030(a)	Maximum(f)	0.005 to 0.010
BORING						
Light duty (1 to 2 inch)	0.15(a)	600 to 1000	0.002 to 0.015	0.010 to 0.020(a)	600 to 1000	0.001 to 0.005
Medium to heavy duty	0.25	Maximum(g)	0.010 to 0.030	0.005 to 0.010	Maximum(g)	0.001 to 0.005
SHAPING						
Heavy duty (36 inch)	0.25	Maximum(h)	0.025 to 0.100	0.005 to 0.015	Maximum(h)	0.005 to 0.010
PLANING	0.25					

A page from
"Machining Alcoa Aluminum"

In figuring on screw machine work for new contracts, don't forget the weight differential. Aluminum gives you approximately three times as many pieces per pound of stock, compared with the heavy metals. Calculate your costs on a per-piece basis, therefore, rather than by weight.

In adopting Alcoa Aluminum for your screw machine work, you will avoid possible hold-ups which may be caused by shortages of other materials. There is plenty of aluminum screw machine stock available today to meet your needs.

Alcoa Alloy 11-S is the stock recommended where high quantity production is especially desirable. High machining speeds are possible, thereby making manufacturing costs low.

The book "Machining Alcoa Aluminum", contains a table of comparative weights, and tables of suggested machining speeds and feeds. For a copy, write ALUMINUM COMPANY OF AMERICA, 2107 Gulf Bldg., Pittsburgh, Penna.

ALCOA ALUMINUM

"BEATEN PATHS ARE FOR BEATEN MEN"

MIGHTY text for a postwar industrial sermon is that given by Eric Johnston . . . "Beaten Paths are for Beaten Men."

Anyone who has followed, even casually, his able leadership of the U. S. Chamber of Commerce will sense that his fight is for men who can change over from business procedures that simply ECHO, to those that SHOUT!

The trouble is that, to many, complete changeover from the beaten path presents many unknowns which cause hesitation.

But, there is a painless and known way to blaze the trail . . .

—exemplified by men who, through Recourse to Arc Welding, changed over our ship construction technique and beat the beaten path method 10 to 1 . . .

—and on other war-machine items, beat it as much as 50 to 1 . . .

—the PROVE-AS-YOU-GO plan, one item at a time:

"Beaten Paths are for Beaten Men," *says Eric Johnston*

Look, Mr. Johnston, how through recourse to Arc Welding, changeover by degrees makes the unbeaten path safe and easy traveling. You not only can PROVE as you go, by weldesigning one part at a time, but IMPROVE as you go, as in the case of this frame for a trencher digging wheel:

Step at a time departure from the beaten path:

The Starting Point. Conventional steel construction. Scrap loss was high. Frequently broke in service.

First Step. Composite of conventional construction with welded-in steel shaft. Breakages eliminated.

Second Step. All welded steel construction. Superior performance. Cost cut 30% from starting point.

This is one of a number of changeovers discussed in the current series of Lincoln Machine Design Studies. Free to engineers and designers.

THE LINCOLN ELECTRIC COMPANY • CLEVELAND 1, OHIO

America's greatest natural **recourse**

ARC WELDING

Gorham

HIGH SPEED STEEL TOOL BITS . . . ANTICIPATE YOUR *Post War Needs*

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GORHAM STANDARD
FOR THE COMMERCIAL FIELD

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GORHAM M-40-B
FOR HEAVY CUTS IN HARD MATERIAL

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GORHAM GORMET
FOR MORE ABRASIVE MATERIALS

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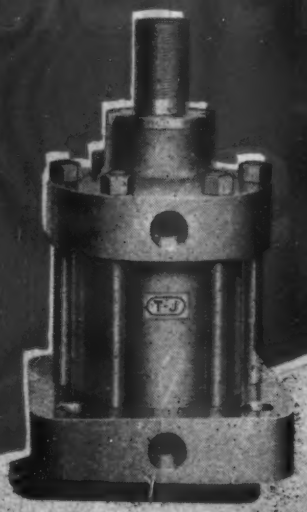
Specialized production in all phases of manufacturing establishes a definite need for GORHAM Tool Bits, and principally because of the fine work they have accomplished during these days of tremendous war production. To meet industry's need, GORHAM has developed three distinct cutting materials for tool bits and turning tools in order to obtain the most satisfactory results and to provide adequately for many different applications. We urge you to anticipate your post war needs for GORHAM products. We will be glad to send all details promptly.

We maintain quantities in stock for immediate shipment . . . quick deliveries also on special sizes and shapes to your specifications and requirements

GORHAM TOOL CO.

14400 WOODROW WILSON • DETROIT 3, MICH.

MOVE "MOUNTAINS or MOLE HILLS"



IN ANY DIRECTION

Here's *efficient power movement* to help you get maximum speed in your production ... use T-J Air and Hydraulic Cylinders! Apply a T-J Cylinder to eliminate muscular effort or to simplify mechanical movements—the ideal way to clamp, press, raise or shift in any direction! Built in many styles, sizes and strokes to meet your requirements ... exerting power movement of 100 lbs. to 12,000 lbs. (direct) with T-J Air Cylinders ... 1000 lbs. to 50,000 lbs. (direct) with T-J Hydraulic Cylinders. Easily and quickly installed. Write for latest catalogs.

FOR TOUGH JOBS SPECIFY

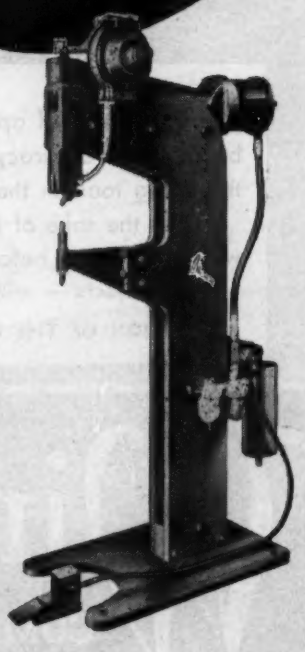
TOMKINS-JOHNSON

RIVITORS · AIR AND HYDRAULIC CYLINDERS · CUTTERS · CLINCHURS

T-J

"Rev'up"

AIRCRAFT RIVETING THE RIVITOR WAY



● T-J Air Powered RIVITOR brings speedy automatic feed-riveting to aircraft production! Designed to handle exclusively aircraft (aluminum alloy) riveting ... Production on the Rivitor depends on the individual application and requires no manual rivet handling. Operates with Air Squeeze action ... cost-cutting efficiency. Soundly engineered, sturdily built. On today's tough production lines, *T-J gets the O.K.!* Write for bulletin. The Tomkins-Johnson Co., Jackson, Michigan.

When PRECISION means SUCCESS

The stamp of approval awarded WINTER TAPS by a host of manufacturers, was earned by making "accuracy" a habit in every operation essential to the production of precision threading tools in the Winter Brothers factory.

For the sake of the critical work you are doing; use these taps with care: Lubricate them well; re-sharpen before they are excessively dull; and your ease of subsequent assembly — without rejects — will prove to you that WINTER TAPS are truly fine threading tools.

A DIVISION OF THE NATIONAL TWIST DRILL & TOOL CO. • ROCHESTER, MICHIGAN

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COMPANY
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Wrentham, Massachusetts, U.S.A.
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FOR GENERAL PURPOSE PLAIN CYLINDRICAL GRINDING . . . FITCHBURG *shows the way to increase production and cut costs*

6-inch Type "B"—The Fitchburg Type "B" 6-inch automatic precision grinder features new engineering principles that result in more economical and faster production of plain cylindrical parts. Made with 18" and 32" maximum capacity between centers.

10-inch Type "B"—The Fitchburg Type "B" 10-inch plain cylindrical automatic precision grinder also incorporates engineering features that result in more economical and increased work production, greater accuracy, and finer finish. Made with 18", 48" and 72" maximum capacity between centers.

Type "C" Adjustable Angular Head Grinder—The Fitchburg Type "C" Angular Head grinding machine is a single application of the Fitchburg Standard Bowgage Wheelhead Unit. It is designed to handle a wide range and a number of types of jobs. The Bowgage Unit is mounted so that it may be located to grind 0 degrees up to a 45-degree included angle. Prompt deliveries can be made. Mail coupon today.

10" TYPE "B" GRINDER

6" TYPE "B" GRINDER

TYPE "C" ANGULAR HEAD GRINDER

Please mail the catalog checked.

6" Type B ☐ 10" Type B ☐ Angular Head ☐

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FITCHBURG GRINDING MACHINE CORP.

FITCHBURG, MASSACHUSETTS, U.S.A.

Manufacturers of—Bowgage Wheelhead Units, Multiple Precision Grinding Units, Spline Grinders, Cylindrical Grinders, Gear Grinders, Both Full Universal Grinders and Special Purpose Grinders.

NORTON ABRASIVES

What's that got to do with OILSTONES?

The answer: EVERYTHING!

For only a properly sharpened knife can do such an expert job so easily and quickly.

The same goes for machine cutters. To do the best work quickly, the edge must be an unbroken straight line; no saw teeth—no matter how microscopic—to bear the full load, break off, rub and generate heat.

Hand stoning as your final sharpening operation most nearly produces that "unbroken straight line," and India and Hard Arkansas Oilstones in hundreds of ingenious shapes and sizes, and at ridiculously low cost, are the unrivaled standards for such precision sharpening.

Have one of our field men or your Industrial Distributor's Representative show you the many special shapes and sizes to fit your own particular operations.

In the Meantime

THIS BOOKLET," Hand Stoned Cutting Tools," will prove an eye-opener for everyone interested in tool improvement and conservation. How many copies can you use?

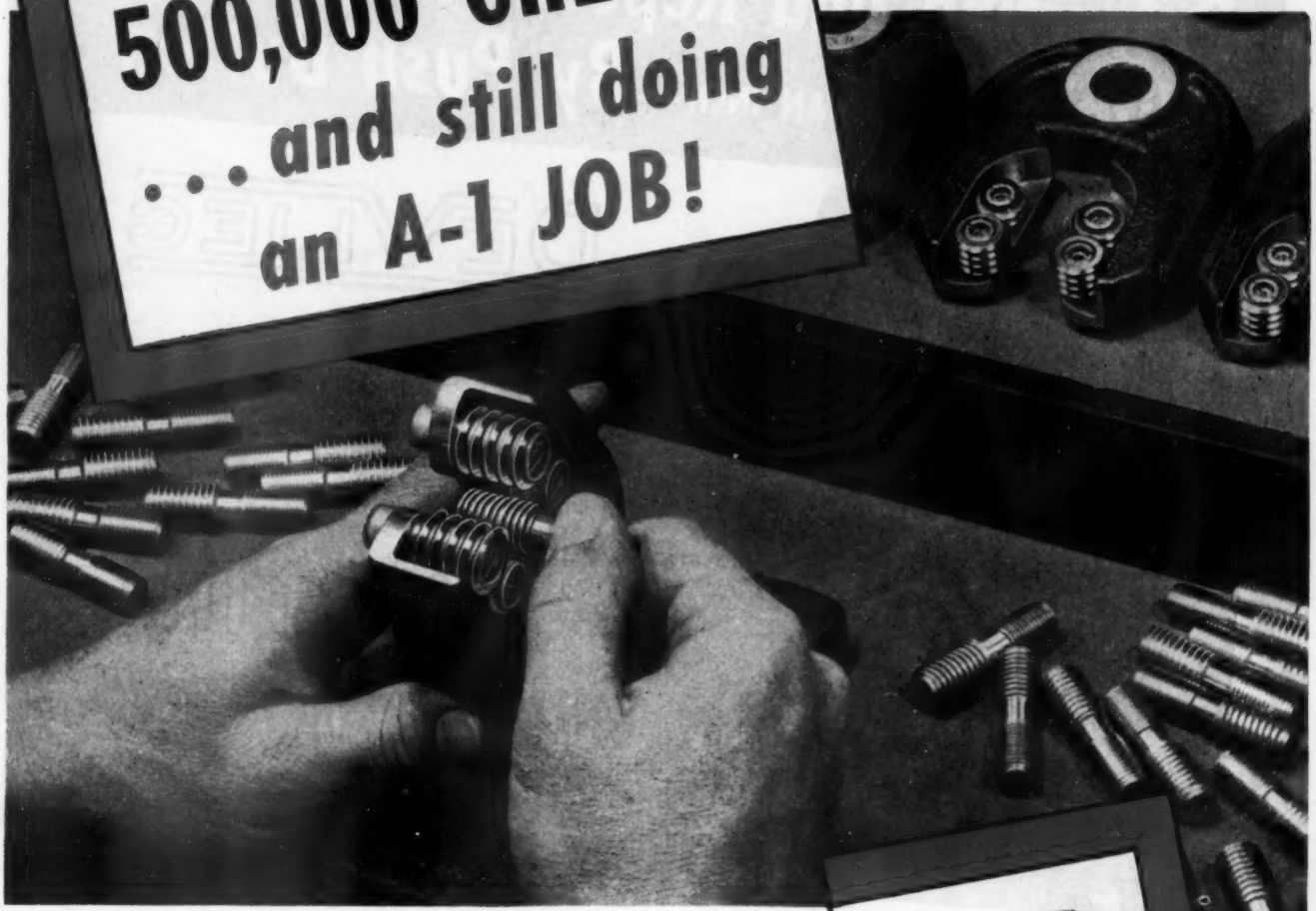
BEHR-MANNING • TROY, N. Y.

(DIVISION OF NORTON COMPANY)

Also Reliable Coated Abrasives Since 1872

P&W Roll Thread Snap Gages

500,000 CHECKS ... and still doing an A-1 JOB!



Here at Pratt & Whitney we've made Roll Thread Snap Gages . . . thousands of them . . . for so many years that we *know* what they can do. For a typical example (and we have hundreds) one of them in an eastern plant — a ½"-32 P&W Gage — has already checked 500,000 screw threads without adjustment and is still going strong. A recent careful inspection of this gage shows *no perceptible wear! This gage should check more than a million pieces and still be in excellent condition.*

When you purchase a Pratt & Whitney Roll Thread Snap Gage you buy with it years of Pratt & Whitney pioneering experience and craftsmanship. As it so handsomely is paying the manufacturer cited above, it will pay you, also, to specify Pratt & Whitney Roll Thread Snap Gages. The precision and quality in any P&W Gage not only guards your production but pays big dividends.

P&W Roll Thread Snap Gages are fast, convenient, economical . . . revealing errors in lead, profiles, thread angle, roundness, straightness and diameter. Write for our literature and get the whole story.

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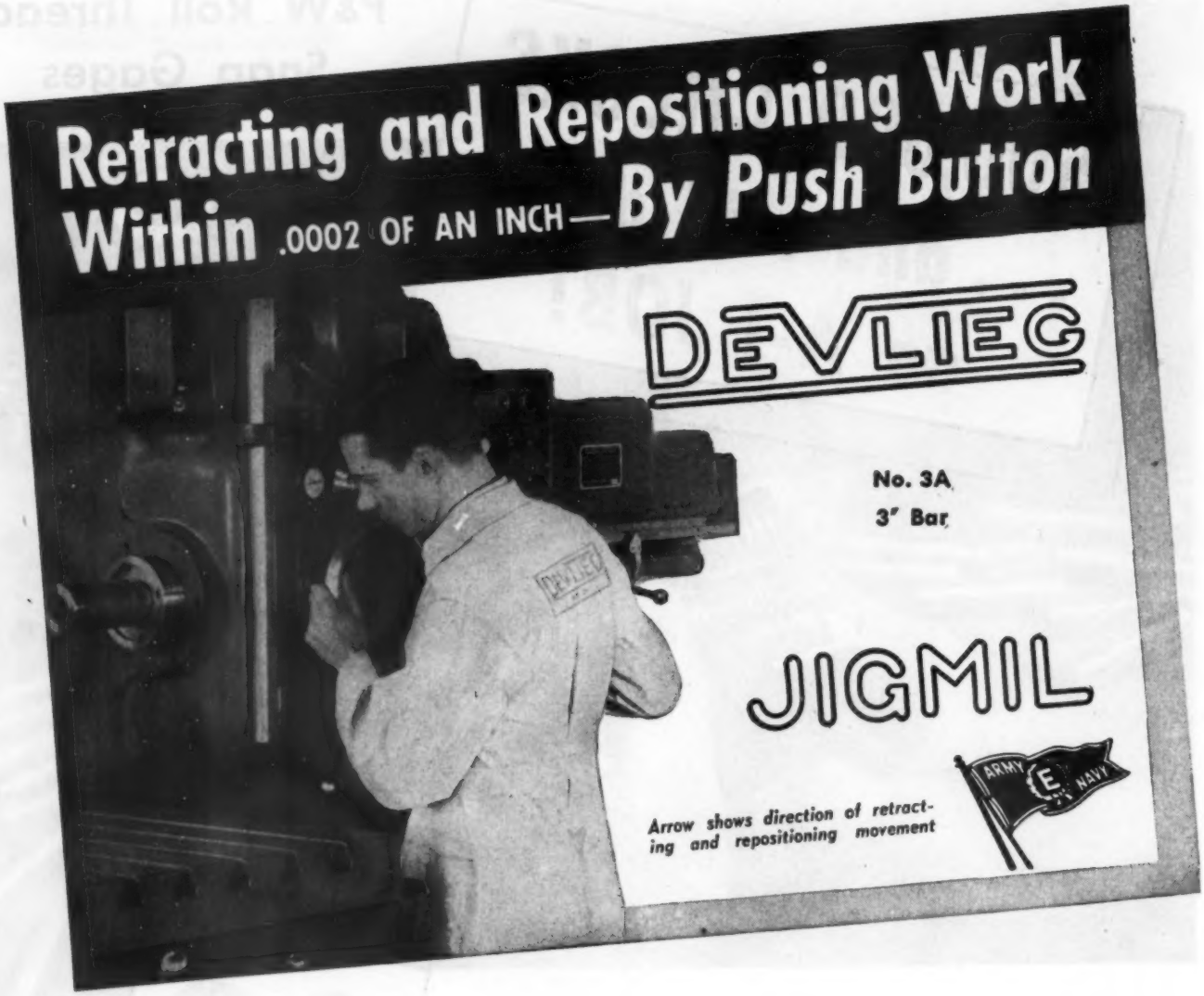
Retracting and Repositioning Work Within .0002 OF AN INCH—By Push Button



The most frequently needed function in a precision boring machine is that of retracting the work to facilitate measuring and tool setting.

In the DeVlieg Jigmil, this function is automatic—by fingertip control. Operation of a push button unlocks the table and moves it by rapid traverse to the desired position for measuring. For repositioning, operation of a single push button will cause the table to return to its cutting position by rapid traverse, stopping and locking automatically. Uniformity of selected position for stopping and locking is dependable within .0002".

The DeVlieg Jigmil is a new type machine—has the spacing accuracy of a Jig Borer—Performance Qualities of a Milling Machine—Convenience and Flexibility of a Horizontal Boring Mill. All control is so centered and organized that the operator never has to take his eyes off the work.

Thus, the Jigmil fulfills the machine tool ideal—a powerful and accurate extension of the operator's hand.

Many machines show 75 per cent greater average daily productivity.

DEVLIEG MACHINE COMPANY

450 FAIR AVE. FERNDALE 20, (DETROIT) MICHIGAN

Write for Circular

DEVLIEG MACHINE TOOLS

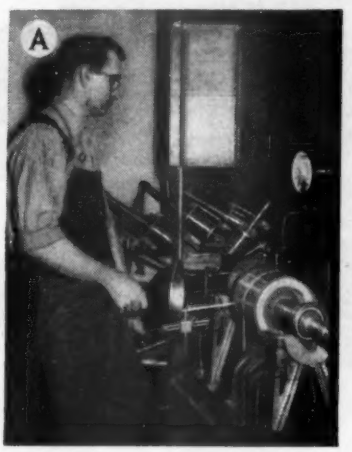
CAN'T QUIVER

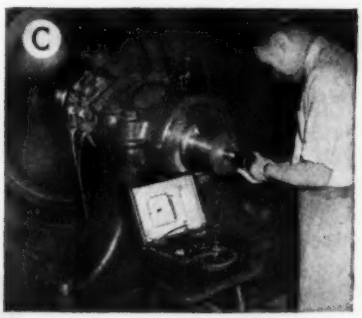
Motors driving precision machines can't quiver without affecting the work, particularly when the motor is mounted directly on the machine. The close tolerances required on so much vital war equipment have intensified the need for machines and motors that remain smooth-running, month after month, in three-shift service. Why have G-E Tri-Clad motors gone on—and stayed on—so many high-precision machines? Our test procedure for balance and vibration is an important part of the answer.

High-precision recessing machine in Waltham Watch Company plant, driven by G-E Tri Clad motor

G.E.'s vibration tests and balancing procedure help make TRI CLAD motors smooth-running and quiet

Unmatched experience in making vibration studies, especially our work on high-speed turbines, helped us to perfect dynamic-balance techniques and devices that give assurance of smooth-running motors. Every Tri-Clad rotor is dynamically balanced, and in addition, spot-checks of assembled motors are made: (A) making an electronic dynamic-balance test on Tri-Clad rotors; (B) spot-check with G-E vibration indicator, with motors on elastic mountings; (C) portable electromagnetic tester being used on large motor. This test can also be applied to a motor installation, if desired. *General Electric Company, Schenectady 5, New York.*





GENERAL ELECTRIC

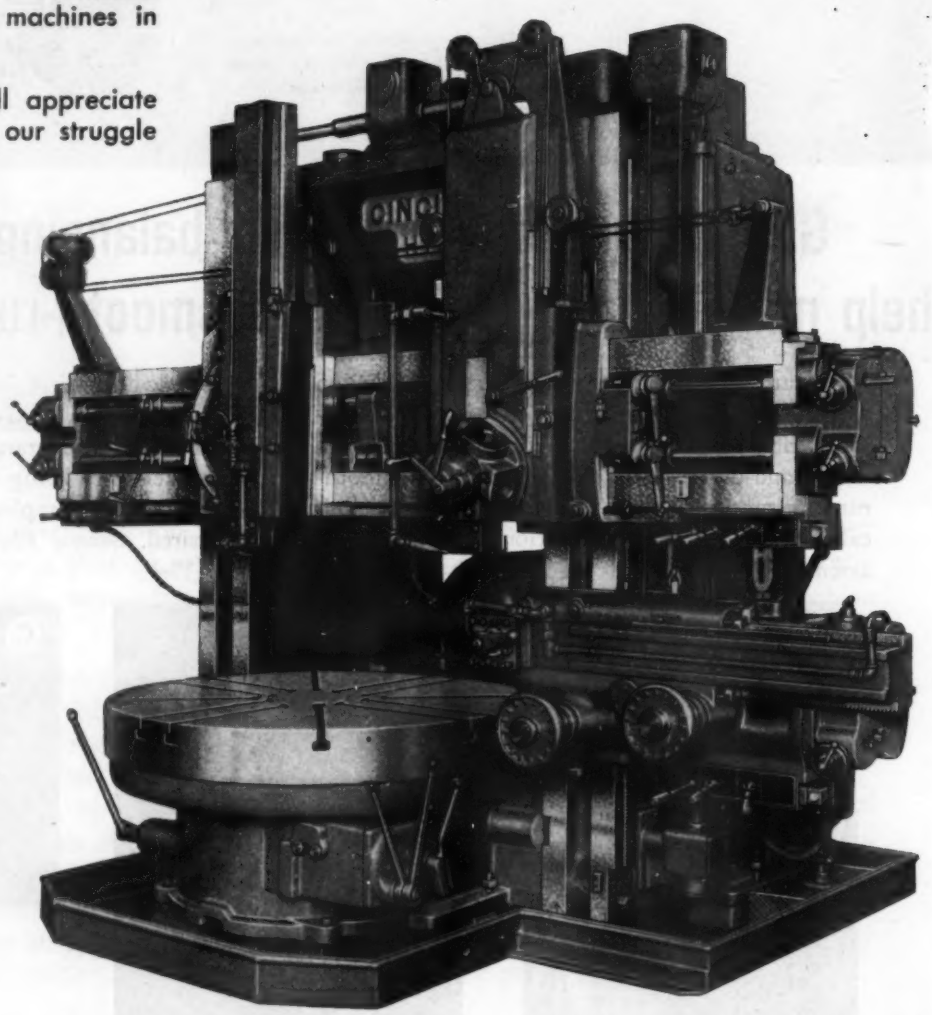
Buy all the BONDS you can—*and keep all you buy*

"Cincinnati Boring Mills and Planers are the Backbone of our Output."

One of America's largest manufacturers of gun-mounts told us in an unsolicited compliment to Hypro-duction machines in his large Mid-Western plant.

He went on to say, "We all appreciate your complete cooperation in our struggle to equip this plant."

—And now you can enjoy even faster cooperation than we were able to give this gun-mount manufacturer — We can now offer Cincinnati Hypro Vertical Boring Mills of all sizes from 54" as illustrated to 12' on very attractive deliveries.



THE CINCINNATI HYPRO 54" VERTICAL BORING MILL

has all of the latest, unexcelled Hypro features. All Cincinnati Hypro machine tools are designed for

- ✓ RIGIDITY
- ✓ ACCURACY
- ✓ SPEED
- ✓ LOW COST

Write for Bulletin 132 describing these mills

THE CINCINNATI PLANER COMPANY

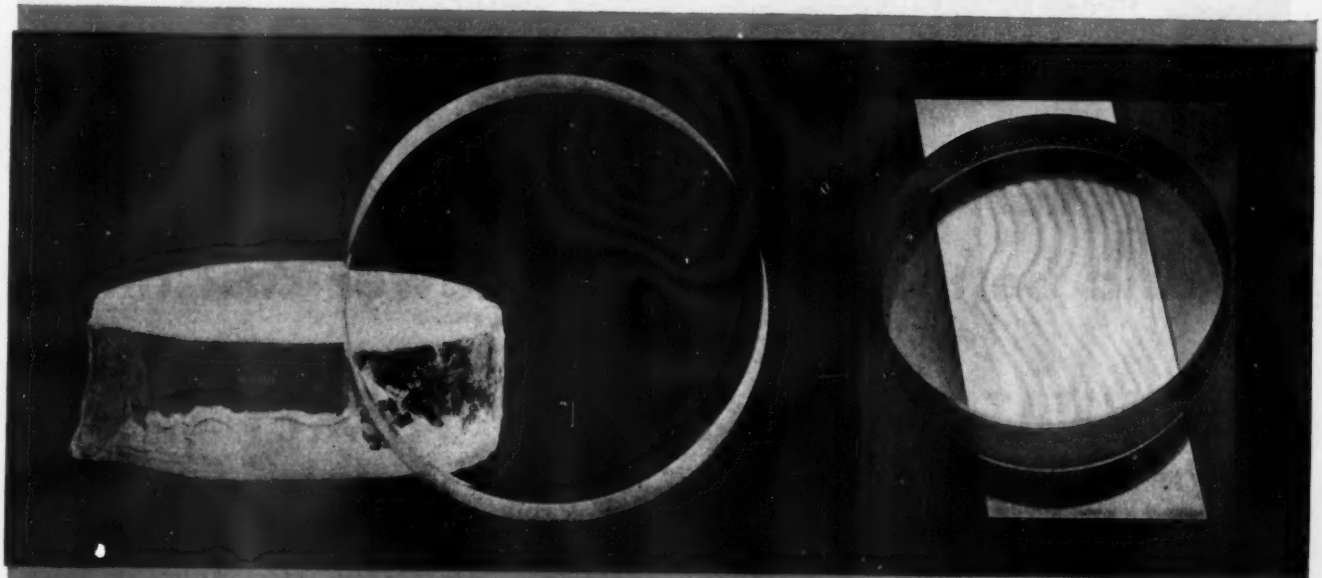
Planers...Vertical Boring Mills...Planer Type Millers

CINCINNATI . OHIO . U.S.A.

Ultimate Accuracy
IN PRECISION CHECKING OF GAGES AND LAPPED PARTS
assured by

Van Keuren

FUSED QUARTZ OPTICAL FLATS



The use of optical flats for precision measurements with light waves was pioneered by The Van Keuren Co. in 1920. The new Van Keuren double surface, pure fused-quartz flats are the result of 25 years of experience. The accuracy and workmanship is superlative.

Fused quartz is highly transparent and has exceptional wearing qualities. The expansion and contraction due to temperature change is 1/16 that of plate glass and 1/6 that of pyrex.

Specify Van Keuren double surface, fused-quartz optical flats for checking flatness of precision lapped parts, maintenance of amplifying gages, and control of gage block wear. They are the most economical to purchase and the most accurate to use.

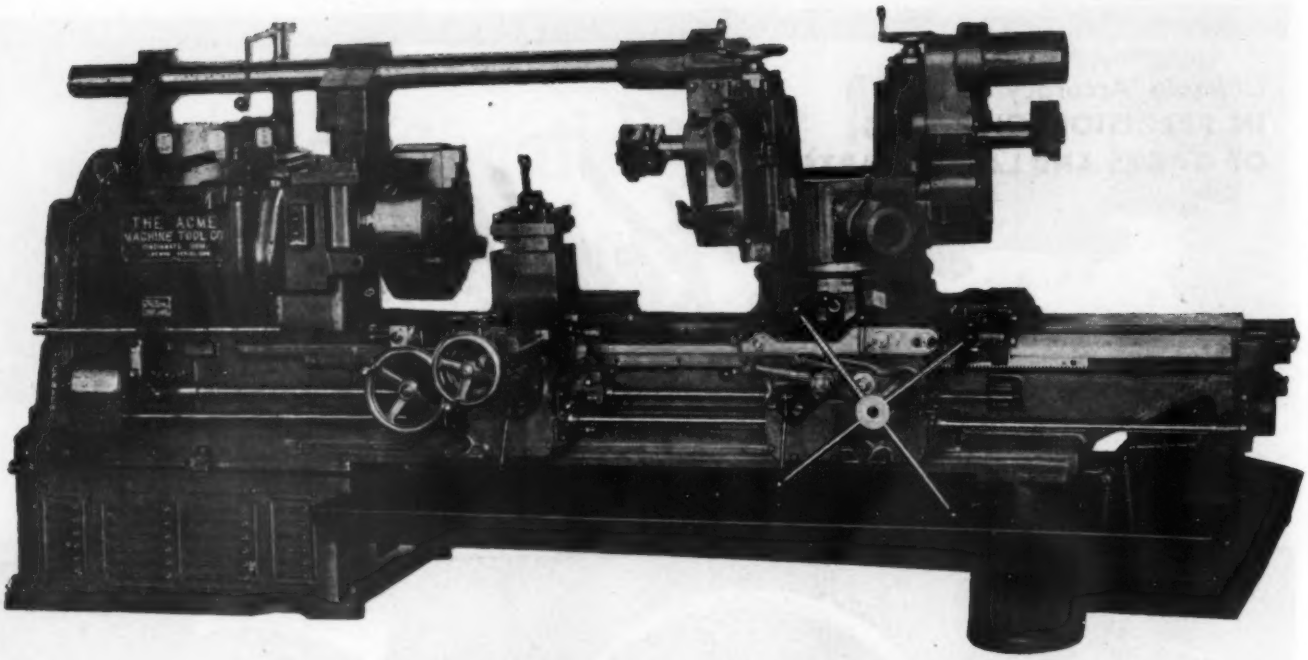
Worn spot .000023" deep revealed on amplifying gage anvil by means of a Van Keuren optical flat.

Consult the 144-page Van Keuren Catalog No. 32 for further details. Send for your copy which also contains complete tables, data and formulas for measuring threads, gears, gages and precision parts.

THE Van Keuren CO. 176 WALTHAM STREET, WATERTOWN, MASS.

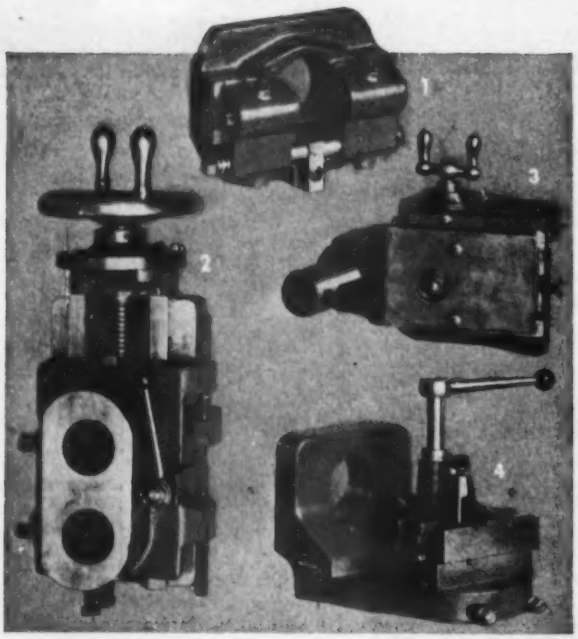
25th YEAR

Light Wave Equipment — Light Wave Micrometers — Gage Blocks — Taper Insert Plug Gages — Wire Type Plug Gages — Measuring Rolls — Thread Measuring Wires — Gear Measuring System — Shop Triangles.



Correct tools do a job faster and better . . . and at a lower cost on

CINCINNATI ACME TURRET LATHES

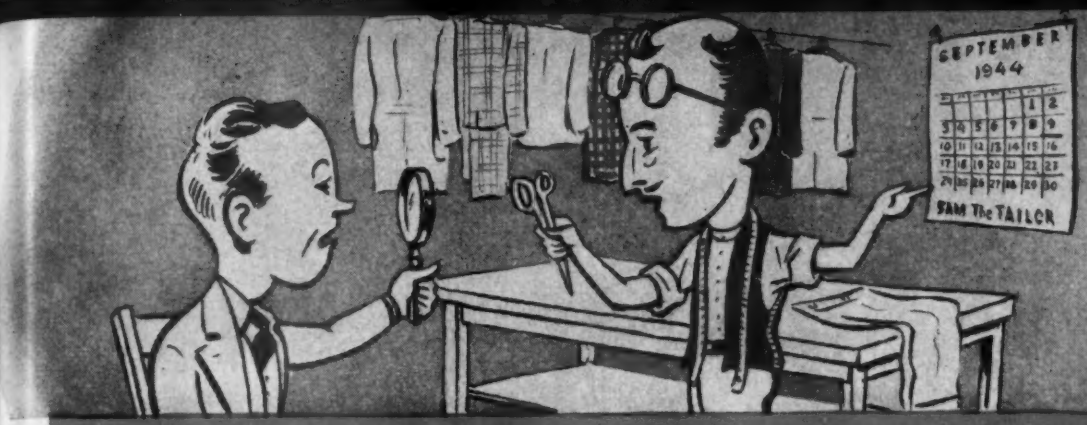


● The group of heavy duty tools and holders shown give Acme Turret Lathes a greater working range—provide closer tolerances—increase production which reduces cost per piece.

The rigidity and massive construction assures ample support to the tools and freedom from vibration and chatter on heavy cuts. All tools and holders shown are adapted for use on the No. 3S Universal Acme Turret Lathe illustrated.

The group consists of: No. 1—knurling tool with 3½" capacity—No. 2—Vertical Slide Tool—No. 3—Angular Chasing Tool Holder for Side Carriage—No. 4—Adjustable Angle Rack Tool.

The ACME MACHINE TOOL CO. ... CINCINNATI 32, OHIO.



Would You Go to a Tailor to Have Your Eyes Examined?

Your eyes are your most precious possession. Certainly, you wouldn't think of having them examined by a tailor. The very idea is absurd!

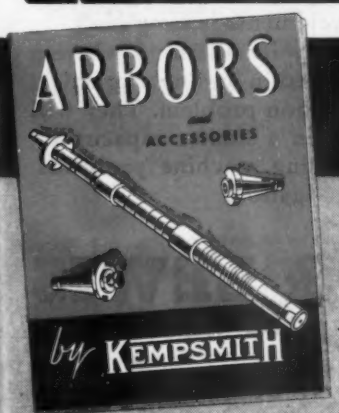
Well, it's just as absurd to buy your milling machine arbors from one who fails to understand arbor needs. Naturally, you would look for a specialist in that field.

Kempsmith has concentrated its efforts in building precision-built milling machines and equipment for more than a half-century. That's why Kempsmith engineers KNOW arbors and accessories . . . KNOW how to build them . . . KNOW how they can best serve your milling requirements.

Kempsmith Arbors, including a full line of standard accessories, are regularly carried in stock for immediate shipment. They are adaptable to ANY make of milling machine equipped with standardized spindle. Also special arbors made for any purpose. Write today for new Kempsmith Arbor Bulletin. The coupon below is for your convenience.

Buy Your Arbors from an Arbor Specialist

KEMPSMITH ARBORS



Precision Built Milling Machines Since 188

Get Your Copy of this NEW ARBOR BULLETIN

Describes the complete Kempsmith line of Arbors and Accessories. Also gives you helpful information on how to keep your arbors in condition. Fill in and mail coupon — today. No obligation.

THE KEMPSMITH MACHINE CO.
1823 South 71st Street, Milwaukee 14, Wis., U. S. A.

YES, I'm anxious to get the right type of arbor for my milling machine. Send me copy of your Arbor Bulletin No. 116.

Name_____

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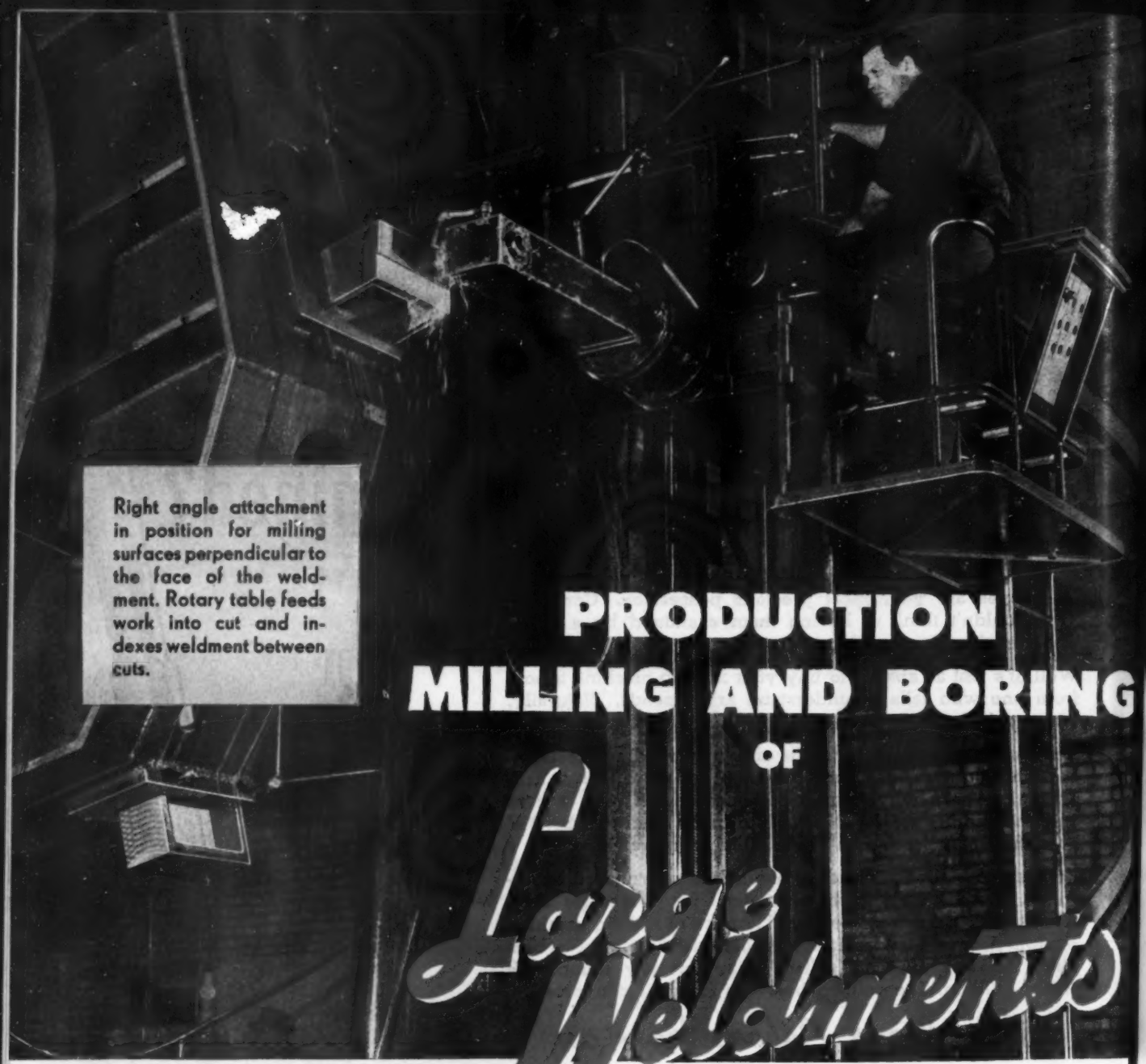


Right angle attachment in position for milling surfaces perpendicular to the face of the weldment. Rotary table feeds work into cut and indexes weldment between cuts.

PRODUCTION MILLING AND BORING OF *Large Weldments*

. . . on a Horizontal Boring Machine

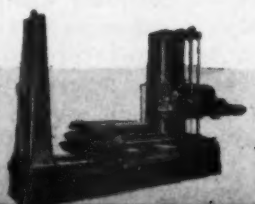
The shape and size of work to be machined often determines the size and shape of the machine designed to do the work . . . particularly when a special machine is required to handle the job. Here, however, is an interesting example of tooling standard horizontal boring, drilling and milling machines for production machining of huge weldments.

The basic machines used are three standard G. & L. Floor-Type Machines. Each is provided with a special rotary table which in turn carries a work-holding fixture. By routing the weldment over four machines, each performing different operations, production is quadrupled, greater accuracy is obtained and handling of the cumbersome weldments is simplified.

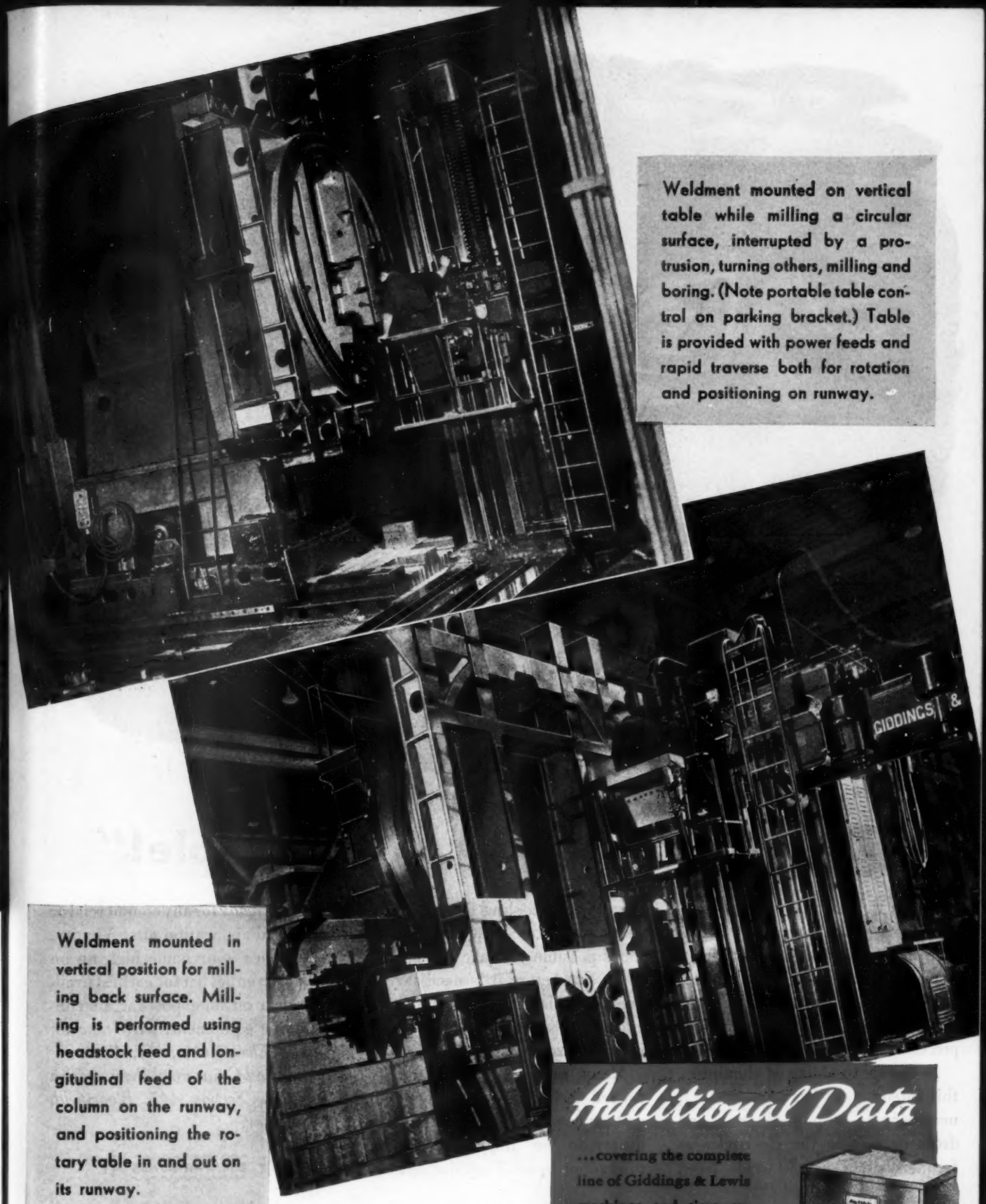
This is only one of many installations wherein G. & L. engineers have assisted in finding a practical solution to a special production problem. They will be glad to work with you in a similar capacity on any of your horizontal boring machine problems. Call upon them without obligation.

GIDDINGS & LEWIS
138 DOTY STREET

Right: G. & L. Table Type Machine.



Right: G. & L. Floor Type Machine.



Weldment mounted on vertical table while milling a circular surface, interrupted by a protrusion, turning others, milling and boring. (Note portable table control on parking bracket.) Table is provided with power feeds and rapid traverse both for rotation and positioning on runway.

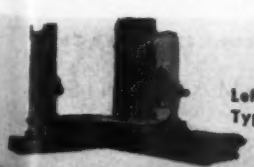
Weldment mounted in vertical position for milling back surface. Milling is performed using headstock feed and longitudinal feed of the column on the runway, and positioning the rotary table in and out on its runway.

MACHINE TOOL CO.

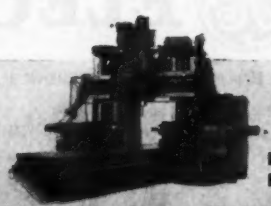
FOND DU LAC, WIS.

Additional Data

...covering the complete line of Giddings & Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin AM94.



Left: G. & L. Planer Type Machine.



Left: G. & L. Multiple Head Type Machine.

"798 . . . 799 . . . 800 . . . Impossible!"

This is a welding tip.

At every weld, it creates a miniature inferno of blazing white heat. It carries heavy surges of electrical current, so intense that the resulting heat will "melt" or fuse two pieces of metal together.

In the spot welding of aluminum, this intense heat has often made it necessary to stop production and dress or replace the electrodes as frequently as every 30 welds. Now, however, by cooling the electrodes with a refrigerated liquid, it is sometimes possible to make as many as 800 welds before it is necessary to dress or replace the welding tips . . . another amazing application of G-E industrial refrigeration!

Many, many other new and improved techniques in refrigeration and air conditioning are helping industry do the "impossible" in war production today. They'll all be available, and *ready* for any commercial or industrial application after Victory.

To place your name high up on the preferential list for earliest available data on finer postwar air conditioning equipment, write *now* to: *General Electric Company, Air Conditioning and Commercial Refrigeration Divisions, Section 447, Bloomfield, New Jersey.*

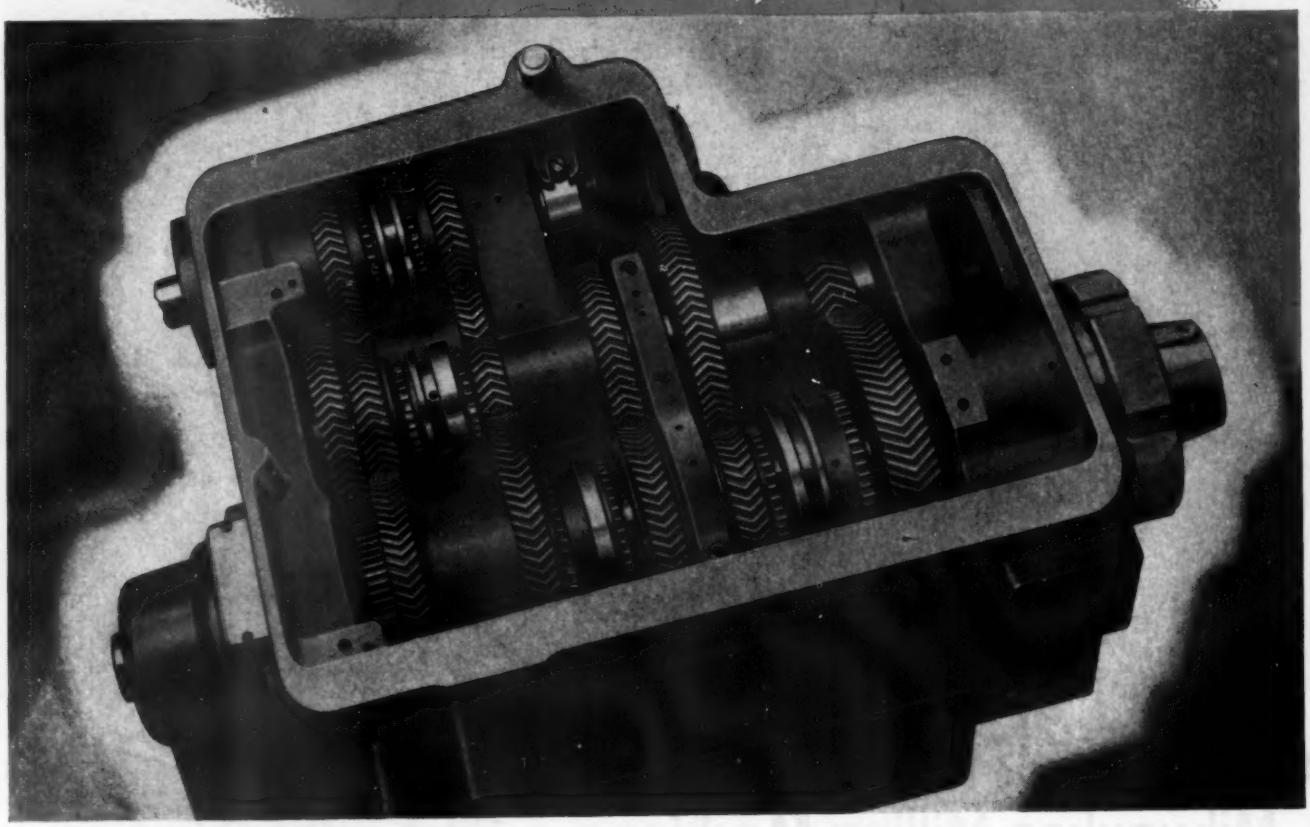
☆ BUY WAR BONDS ☆

Industrial Refrigeration by

GENERAL ELECTRIC

Hear the General Electric Radio Programs: The "G-E ALL-GIRL ORCHESTRA," Sundays, 10 p. m., EWT NBC . . . "THE WORLD TODAY" News, Every Weekday, 6:45 p. m., EWT, CBS

A BOXFUL OF *Speed* AND *Precision*



FOR MODERN MACHINE TOOLS

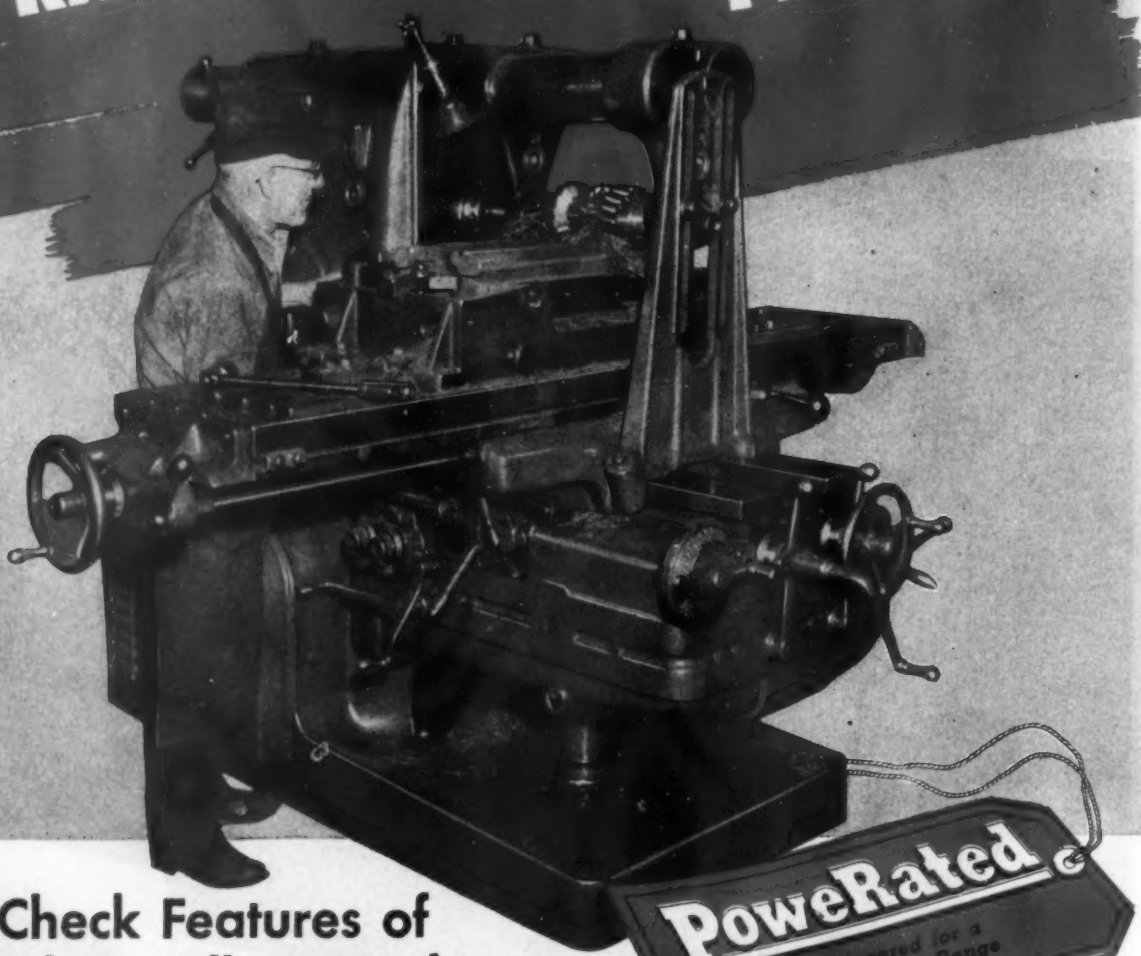
This is the headstock used in Sidney 16-speed, Herringbone Geared Lathes. It is an important factor in the extreme and sustained accuracy of these machines, for all shafts—including the spindle itself—are mounted on Timken Tapered Roller Bearings.

The Sidney Machine Tool Company, Sidney, Ohio, celebrating their 40th Anniversary, point with pride to a long record of success with Timken Tapered Roller Bearings and gives them full credit for the part they play in the outstanding performance of Sidney machines.

Because of advanced design, careful workmanship and the free use of Timken Bearings, the Sidney lathes you buy today will be in line with the times for many years to come. The Timken Roller Bearing Company, Canton 6, Ohio.

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

✓RANGE ✓POWER ✓PRECISION



Double-Check Features of Milwaukee Milling Machines

Range in a milling machine — the capacity to handle a wide variation of operations at the most efficient feeds and speeds—is always an important factor.

But today — with advancements in cutting tools — motor hp. is the important feature to be checked when purchasing milling equipment. Be sure the milling machine you are considering is power-engineered to do the job — designed and built in relation to and with ample motor power for the work for which it is intended.

There is no need to resort to the unsound practice of substituting a higher hp. motor to gain power. The range of models of Milwaukee Milling Machines makes available a machine PoweRated and properly engineered for every class of job.

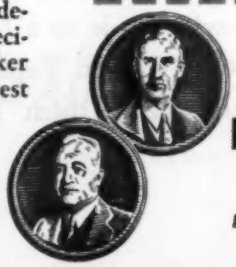
All Milwaukees are PoweRated — power-engineered in keeping with their rated motor hp. plus the normal overloads. They are precision-built and are capable of sustained precision-performance throughout a long productive life.

Remember — think of feed and speed range for light cuts — adequate motor power for heavy cuts — the need for sustained precision performance at all times. Check with a Kearney & Trecker field engineer in deciding which PoweRated Milwaukee is best suited to your specific needs.

MEANS EVERY MILWAUKEE MACHINE IS POWER ENGINEERED TO DO THE JOB

Milwaukee PoweRated Milling Machines

- Standard Models — Horizontal, Vertical and Bed Types — available in Motor ranges from 3 to 25 HP.
- C.S.M. (Carbide Steel Milling) machines 20 to 50 HP.
- Special Machines—Consult K & T engineers.



Milwaukee Machine Tools

KEARNEY & TRECKER CORPORATION

MILWAUKEE 14 WISCONSIN

SPECIFICATIONS:
1″ collet capacity, 9″ swing, 16″ center distance, sixteen spindle speeds from 27 to 1750 r.p.m.

HARDINGE

High Speed Precision TOOL ROOM LATHE

When tool room collet work with one inch diameter or less is done on heavy lathes designed to produce large work, here is what happens—time is lost, machines lose money by under-capacity production, excess power is consumed for the work involved and floor space is wasted.

For profits proportionate to machine investment, use the proper size tool room lathe comparable to the work involved.

To have complete information on a precision machine designed for speedy turning, boring and threading, obtain a copy of our bulletin illustrating and describing the above unit.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

Setting Performance Records for Precision Machining

South Bend Precision Turret Lathe in the Factory of the Republic Aviation Corporation

High precision and close tolerances have always been the watchwords of the aviation industry. But with the war came demands for higher speeds and better performance. This meant that even closer tolerances had to be established and maintained through the greatest production schedules in history. We are proud that providing lathes to meet the exacting requirements of warplane production is one of our important assignments. Throughout the aviation industry South Bend Lathes are setting enviable performance records for precision machining.

In all metal working industries, South Bend Lathes are giving the same dependable service that they are giving in the aviation industry. Versatile and efficient, they are also used for emergency service work by the Armed Services. They travel with the Army in compact mobile machine shops. Many fighting ships of the Navy have one or more South Bend Lathes on board for making emergency repairs at sea. They are used by the Air Forces in repair bases here and overseas—sometimes even flown by plane for emergency service in remote locations.

Now, as before Pearl Harbor, our entire factory is devoted to the production of South Bend Lathes. No other product is made by us. There has been no lowering of standards because of wartime restrictions and shortages. The use of substitute materials is negligible, limited to a few non-essential parts such as name plates, paint, etc. Improvements have been accelerated. Today, South Bend Lathes are better in every way.

South Bend Engine Lathes and Toolroom Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swing. Precision Turret Lathes are available in two sizes: Series 900 having 9″ swing with ½″ collet capacity, and Series 1000 having 10″ swing with 1″ collet capacity. Write for Catalog No. 100-C.

POST-WAR PRIORITY PLAN

To those who cannot qualify for a war-time priority, South Bend Lathe Works offers a practical Post-War Priority Plan. You can place your order now for any South Bend Lathe. No deposit or down payment is required. We ask only that the order be placed in good faith. When civilian production is resumed, orders will be filled in the sequence established by the numbers of the Post-War Priority Certificates. Should conditions necessitate, the order may be cancelled at any time. Write for details of this plan.

BUY WAR BONDS NOW...SAVE FOR LATHES

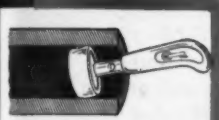
SOUTH BEND LATHE • WORKS

LATHE BUILDERS FOR 37 YEARS • SOUTH BEND 22, INDIANA

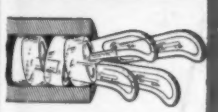
STANDARD

TeBo Gages

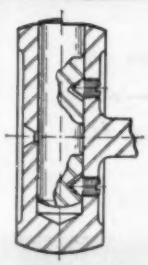
NOW produced in America for American Industry



ONE OPERATION
Checks Minimum and Maximum Tolerances



REVEALS BORE CONDITION AT ANY POINT



ADJUSTABLE FOR CHANGE OF TOLERANCES

Check Bores in ONE Operation More Accurately, 60% Faster Than Conventional Type Plug Gages

TeBo GAGES, long the favorite bore checking instruments of Swedish and other European precision workers, are now produced by Standard Gage Company. Considered by users the most desirable fixed limit type gage, TeBo can make a tremendous contribution to precision in American mass production. It performs, in *one* operation, the several functions required of plug gages, with an ease and accuracy that is a revelation to expert craftsmen.

With TeBo Gages, both minimum and maximum limits may be checked in *one* operation. They reveal the internal conditions of the bore at any point, indicating such factors as out-of-round, taper, belling, as well as dimensional deviations. They can be used with equal accuracy in soft as well as hard metals. May be used in thin walled bores without risk of distortion.

The chromium plated TeBo Gage head is a section of a true sphere, the ideal shape for internal gaging. It passes through a bore freely, without jamming or forcing. A spherical projection controls maximum tolerance measurements. Standard Gage has added adjustability to this projection by means of two ingenious set screws.

TeBo Gages are light in weight and precisely balanced. They minimize fatigue and may be used over long periods without strain. Their operation is so simple and direct and their findings so easily understood that major gaging operations may be entrusted to workers of slight technical skill. Users report savings up to 60% in gaging time through use of TeBo Gages.

WRITE FOR NEW TeBo GAGE BOOKLET

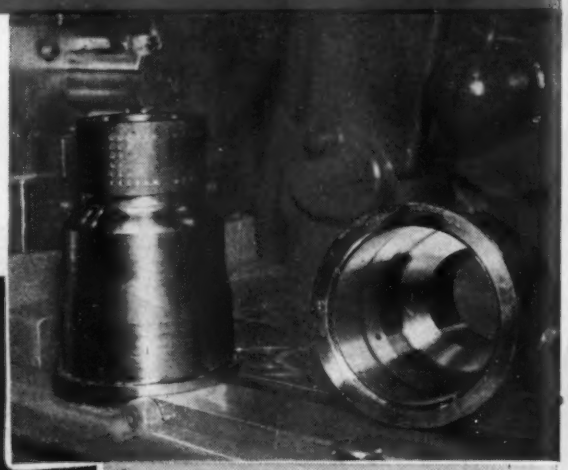
ARMY (E) NAVY

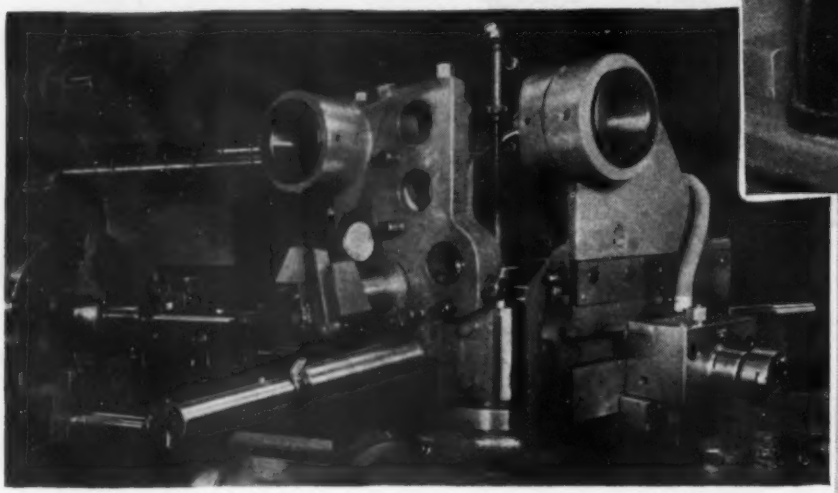
STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

PREPARE NOW FOR COMPETITIVE POST-WAR NEEDS—by RE-TOOLING YOUR P&J EQUIPMENT

● TOOLED FOR TODAY'S TEMPO

With the set-up as shown here, this 6 DREL P & J Automatic turned out the plain half of blade gears at the rate of approximately 4 per hour. Operations included rough boring two diameters, rough facing, rough turning, rough finishing, semi-finishing and chamfering. The part being machined is a steel forging.





P & J
REBUILDING SERVICE

Present owners can have their P&J Automatics rebuilt in the P&J plant and thereby restore these machines to original productivity and accuracy. Re-tooling can be handled efficiently at the time of rebuilding.

● RE-TOOLED FOR POSTWAR COST-CUTTING

How to get prices *down* on peace time products will be one of those knotty problems which must be tackled sooner or later. Cost-cutting technique will have to be studied and applied. A situation like this will find shops with P&J Equipment in a strategic position. It is a comparatively simple matter, with P&J chucking equipment and their wide latitude of tooling possibilities, to design the best possible set-ups for the maximum in speed, efficiency and economy. P&J engineers are specialists in tooling and are ready now to apply their wide experience to help you re-tool your P&J Equipment for postwar competitive needs.

● ***There'll be a lot you can have TOMORROW—with the Bonds you buy TODAY.***

Potter & Johnston Machine Co.

PAWTUCKET, R. I.

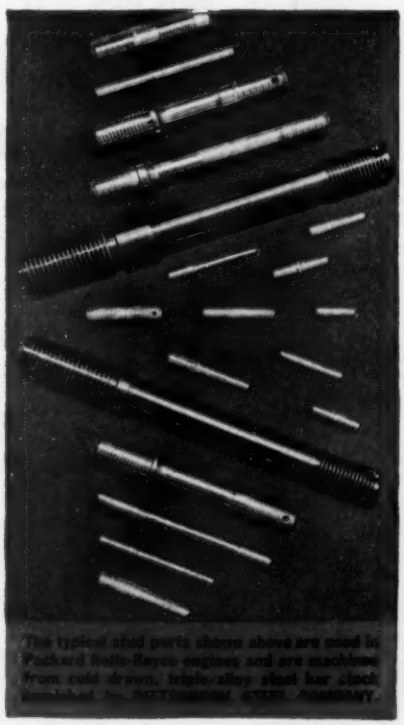
Pittsburgh Alloy Steel is used in Packard-Built Engines

IN the speedy Mustang that slashed cross-continent in a record breaking 6 hours, 31 minutes, *Pittsburgh Alloy Steel* went along for the ride. And when a Mosquito Bomber thundered Labrador to London in a time-clipping lunge, *Pittsburgh Alloy Steel* was ticking off the miles and minutes with it. For in the Packard-built Rolls-Royce engines that power these famous ships, precision parts made from Pittsburgh "aircraft quality" alloy bars, wire and tubing function vitally.

So what?

So *again* it has been clearly demonstrated that *open-hearth* alloy steel, as produced by Pittsburgh Steel Company, has achieved perfection that meets specifications for the toughest alloy steel applications. Only the *best* in steel is good enough to fly!

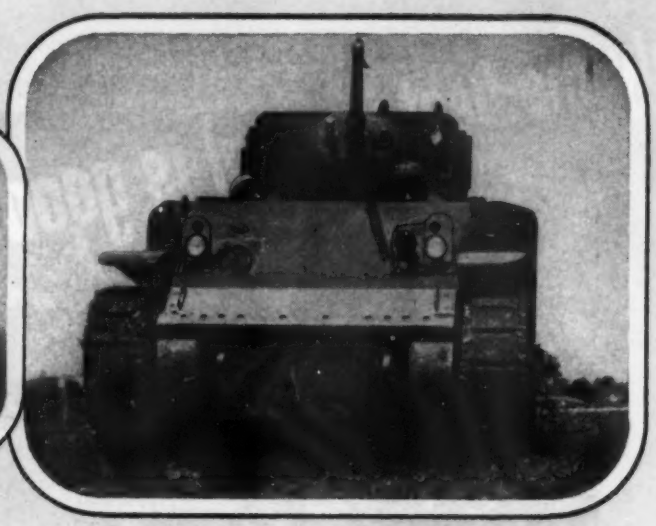
When your requirements for alloy grades combine the problems of manufacturing economy, *Pittsburgh* Alloy Steel, made by the Open-Hearth Process, can often fill the need exactly. Send us your specifications for analysis, recommendations and pricing.



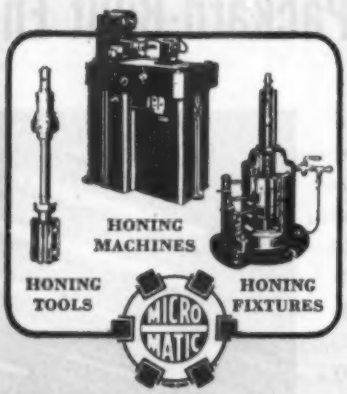
PITTSBURGH STEEL COMPANY
1648 GRANT BUILDING, PITTSBURGH, PA.

PITTSBURGH ALLOY STEEL

BILLETS, BARS, WIRE, TUBING: ALSO CARBON AND STAINLESS STEEL



From plowshares to SWORDS ...TO PLOWSHARES



Micromatic

HONE CORPORATION

Detroit, Michigan

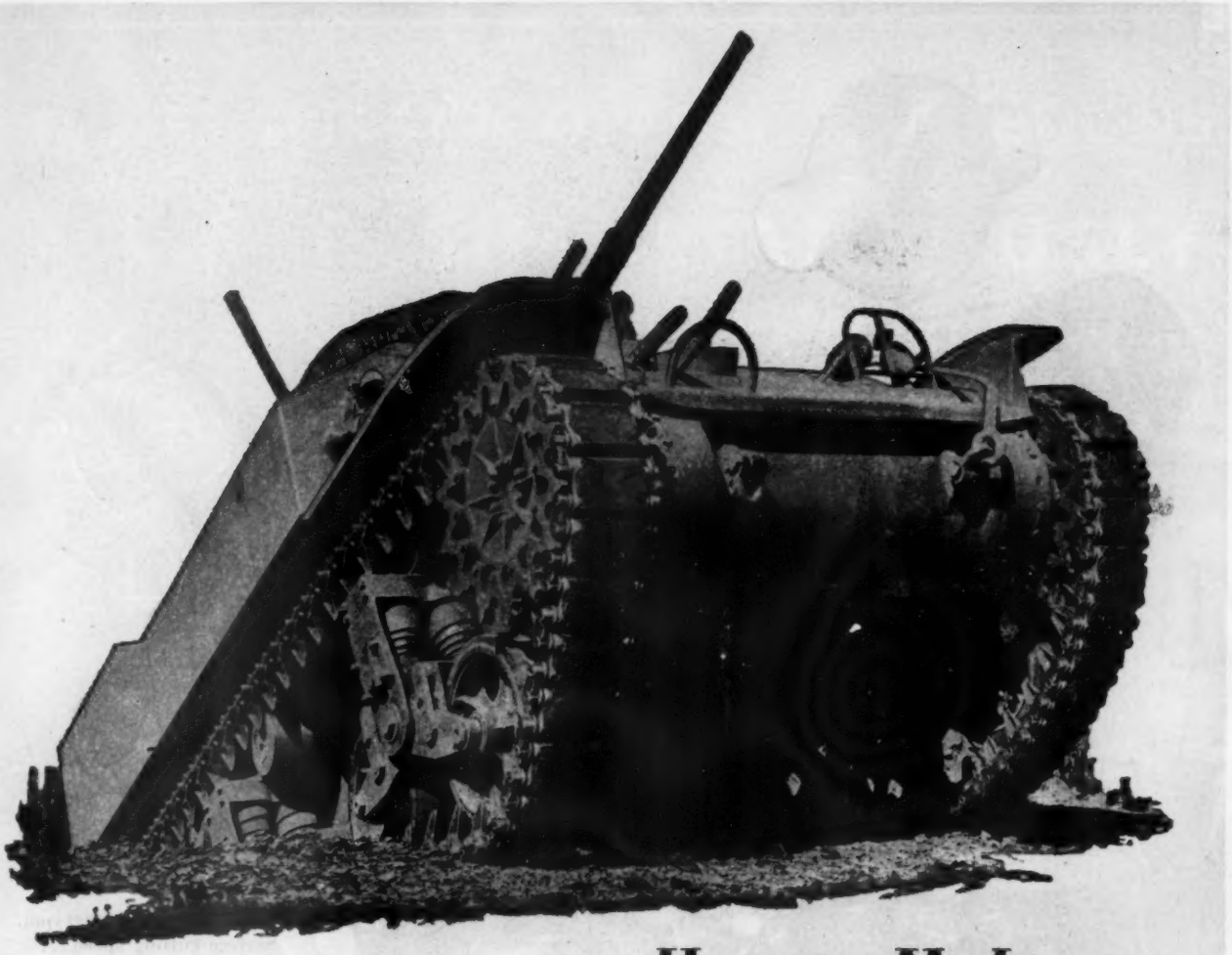
Yesterday—*The steam "traction engine" gave way to the gas powered crawler tractor just in time to suggest the World War I tank. It was only a crude, slow moving offensive weapon, but it promised tremendous tactical advantage. Only the use of early abrading processes made it possible.*

Today—That swift powerful engine of destruction—the modern tank—is the product of many years of combined experience in ordnance and automotive practice. Honing, the advanced abrading process, is of utmost importance in making possible this modern beating of "plowshares" into "swords".

Tomorrow—Our "swords" must again become "plowshares"—war developments always produce technological advances usable in peace. What these advances may be, we can only guess. But the fundamental process of Microhoning will be ready with new refinements to meet these needs.

This process which generates bore accuracy for roundness and straightness within .0002" to .0003"—which removes up to 65 cubic inches of stock per hour, has been developed into many ramifications, now being used for war machines. Tomorrow they will be available to speed peacetime production.

MAKERS OF HONING MACHINE TOOLS



How to Make a Sprinter out of a PILLBOX

Tons of metal—guns and ammunition—fuel—charging over a blasted landscape at 45 miles per hour—the "pill box" has become a sprinter in the modern tank.

Performance of this effective war machine depends on the modern engine power plant—the way it is designed and made. This engine must have amazing stability, durability—highest all around performance qualities. Yet it must lend itself to fastest maintenance or repair with minimum equipment.

Microhoning contributes largely to this result because it offers the most modern method of final precision stock removal and close control of surface character.

It provides a high degree of accuracy and any desired surface finish—*without* injurious frictional heat—*without* deformation of subsurface metal structure.

Without this close precision and controlled finish, modern tactical use of the tank would be impossible.

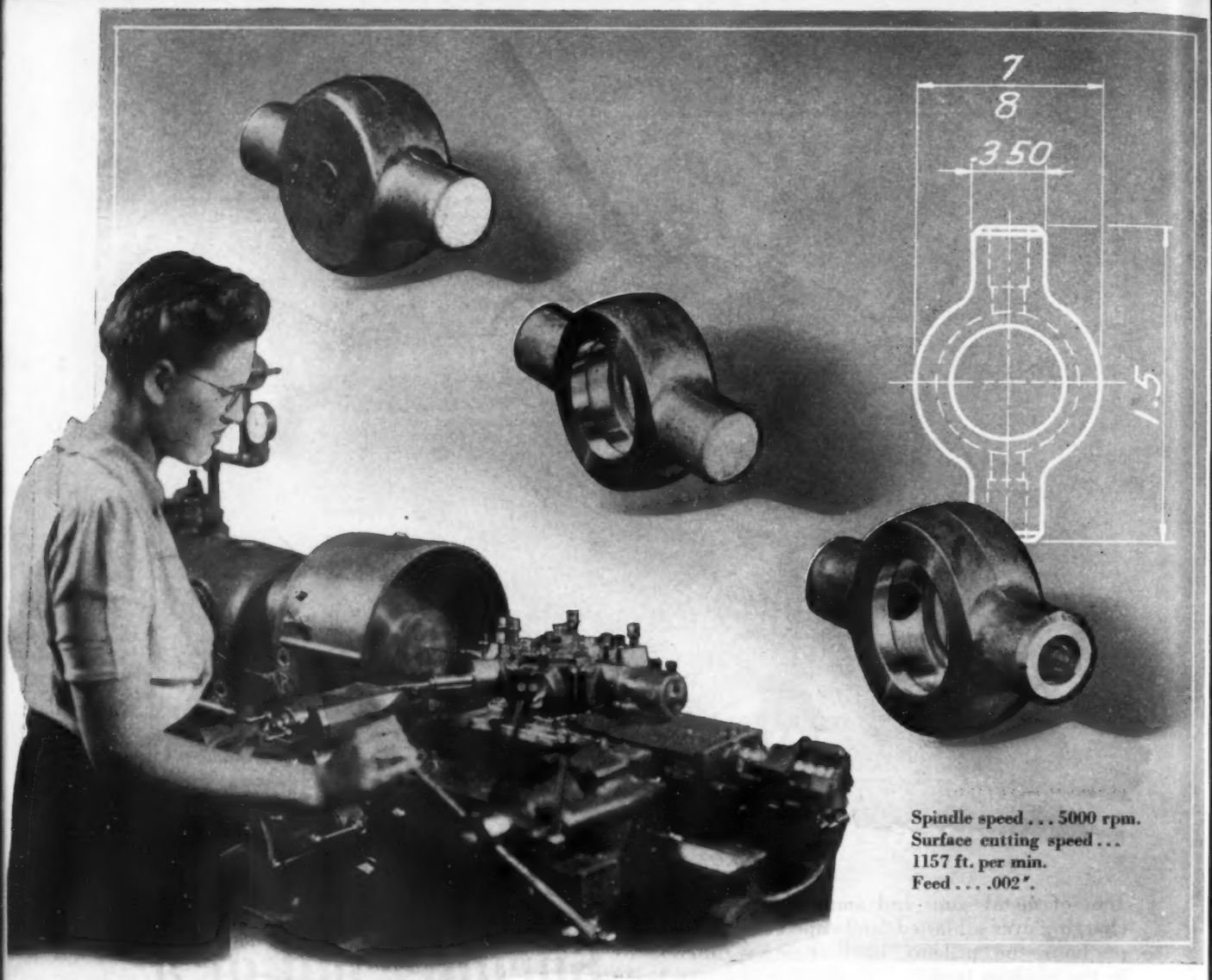
Some Microhoned Tank Bores

Gas and Diesel Engine Cylinder Bores and Sleeves • Connecting Rod Bores (Large End) • Valve Guide Bores • Diesel Fuel Injector Bores • Transmission Gear Bores • Gun Recoil Cylinders • Gun Predictor Hydraulic Cylinders • And Many Other Parts

MICRO MATIC

MICROMATIC HONE CORPORATION

DETROIT, MICHIGAN



Spindle speed . . . 5000 rpm.
Surface cutting speed . . .
1157 ft. per min.
Feed . . . .002".

FROM FORGING TO FINISH IN 168 SECONDS ON A *Monarch Production Lathe*

At spindle speeds of 5,000 rpm., Monarch 10" Production Lathes make short work of finishing this brass forging for aircraft lubrication systems.

The first operation drills, reams, grooves (in bore), faces one side and chamfers 3 edges in 50 seconds, floor to floor.

Next, the other side is faced and one edge chamfered, in 18 seconds, floor to floor.

Finally, 2 diameter holes are step-drilled, the other end is faced and chamfered, in 50 seconds for each end. Total time, 168 seconds from floor to floor.

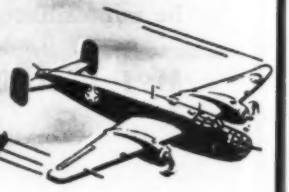
Such cutting speeds would not be possible were it not for Monarch's improved lubrication method for the precision bearings, permitting cool, distortionless, high precision machining. With stepless range of speeds, simple tooling, quick operating cycle and ease and speed of control, these Monarch 10" Production Lathes turn out more work per day . . . at lower costs.

When their war work is finished, they'll be quick to go into peacetime production, because their ability to cut costs will be as important then as their speed is now. If you are interested in applying Monarch 10" Production Lathes to your work, our engineers will gladly help you.

THE MONARCH MACHINE TOOL COMPANY · SIDNEY, OHIO

BRANCHES:
622 West Washington Blvd., Chicago 6, Ill. · 10465 Carnegie Ave., Cleveland 6, Ohio · 512 Empire Bldg. Pittsburgh 22, Pa.
801 Fisher Bldg., Detroit 2, Mich. · 635 Industrial Office Bldg., Newark 2, N. J. · *Representatives in principal cities.*

Monarch Saves Time



FLUTES SPIRAL IN OPPOSITE DIRECTIONS SIMULTANEOUSLY ON THIS PATENTED EXPANSION REAMER

Unusually large expension range enables the patented Lempco reamer to finish as many different size holes as would ordinarily require 6 to 8 conventional expansion reamers. Right-hand flutes on two blade segments spiral counter to left-hand flutes on the third blade segment, simultaneously. Reams satin-smooth finishes in any machinable metal or plastic. Extension pilots for alignment jobs.

- ★ *Eliminates Honing*
- ★ *Five Types Available*
- ★ *Requires Less Driving Power*
- ★ *Adjustable without Changing Set-up*
- ★ *Extension Pilots for Alignment Jobs*
- ★ *.035" to .080" Straight Line Expansion*
- ★ *Blades May Be Resharpened 8 to 10 Times*
- ★ *New Blade Segments Inserted in Thirty Seconds!*

WRITE FOR SPECIFICATIONS

LEMPCO

5711 DUNHAM ROAD
BEDFORD, OHIO

Better LUBRICATION MEANS *Better Maintenance*

• Excessive wear and difficult maintenance often result from inadequate lubrication.

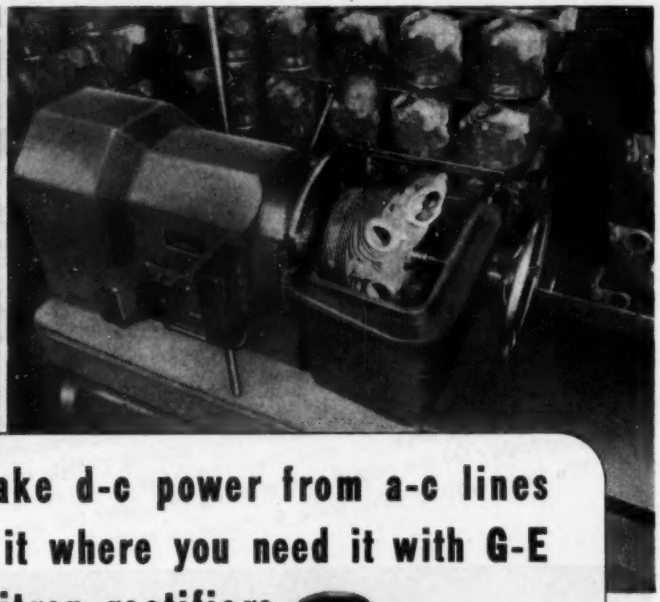
Sinclair provides a range of specialized oils and greases for *better lubrication* of *MACHINING EQUIPMENT*. These lubricants together with Sinclair Cutting Oils and Coolants satisfy shop requirements for low equipment maintenance costs and high speed precision output of machined products.

• •

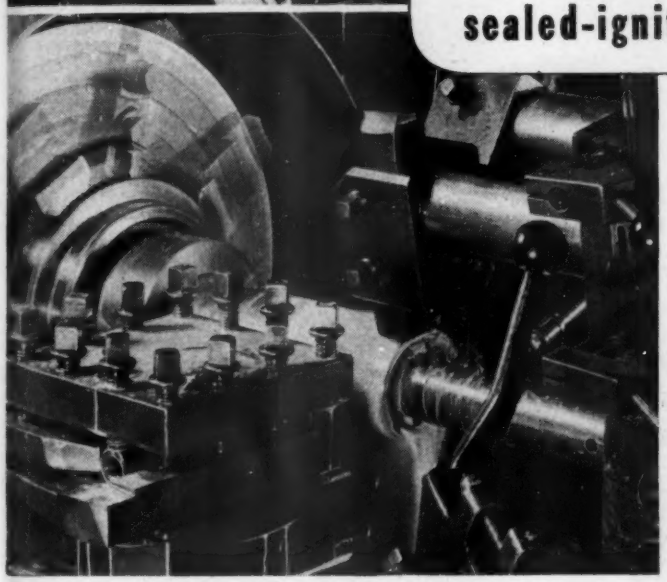
(Write for "The Service Factor" — published periodically and devoted to the solution of lubricating problems.)

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE SINCLAIR REFINING COMPANY, 630 FIFTH AVENUE, NEW YORK 20, N. Y.



You can take d-c power from a-c lines and "spot" it where you need it with G-E sealed-ignitron rectifiers



The thyratron (left) is the "timer" tube, which usually teams up with the ignitron (above)

THE steel-jacketed G-E ignitron is an electronic tube of many uses, and nowhere is its versatility better demonstrated than in converting a-c to d-c *economically and efficiently*.

Many power-driven machines, such as machine tools, cranes, etc., require d-c power to drive them because of the necessity of the adjustable speed which the d-c motors can provide. The G-E steel ignitron takes a-c from the power lines, rectifies it, and supplies it to the *specific* locations where d-c motors require it.

Thus, without effect on any other equipment, or on the distribution system as a whole, d-c power can be fed to such diverse machines as drill press, milling machine, power lathe, grinder, and sander. Production is stepped up, and costs, in many cases, are reduced.

The G-E steel-jacketed ignitron tube has no moving parts; is quiet in operation; efficiency is high and practically constant over the entire load range. It can successfully carry severe peak loads.

The ignitron is only one of a complete line of G-E electronic tubes for innumerable industrial jobs. Through its nation-wide distributing system, General Electric is prepared to supply users of electronic devices with replacement tubes.

"HOW ELECTRONIC TUBES WORK"

This booklet will be mailed to you on request —*without charge.* Address *Electronics Department, General Electric, Schenectady, N. Y.*

• *Tune in* **"The World Today"** *and hear the news direct from the men who see it happen, every evening except Sunday at 6:45 E.W.T. over CBS. On Sunday listen to the G-E* **"All Girl Orchestra"** *at 10 P.M. E.W.T. over NBC.*

G.E. HAS MADE MORE BASIC ELECTRONIC-TUBE DEVELOPMENTS THAN ANY OTHER MANUFACTURER

GENERAL ELECTRIC

182-C10-8850

How many machine tool operations help to make him

the safest flyer in the world . . .

America spends more time, more money, more effort to protect the life of a flyer than any other country in the world . . . He is the unexpendable.

Into a single engine of his plane go as many as 84,000 individual manufacturing operations . . . to accuracies as fine as four-millionths of an inch.

And of all the machine tools in use by the aviation industry, none is more basic or more vital than the internal grinding machine.

Bryant engineers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

We invite you to send for a Bryant man today.

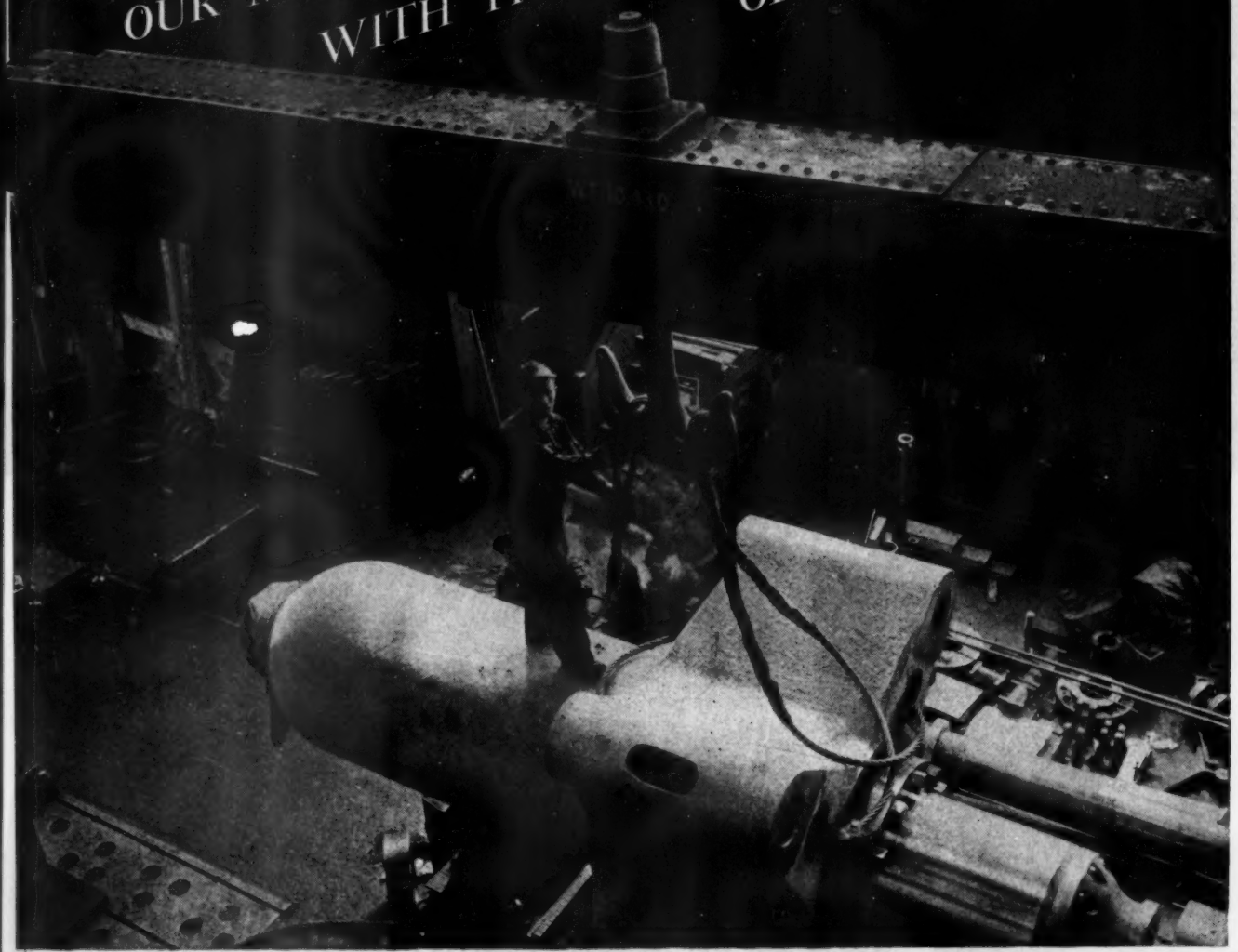
BRYANT

CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.

ASK US IF IT IS HYDRAULIC

OUR MACHINERY IS BUILT IN ACCORDANCE WITH THE SPECIFIC REQUIREMENTS OF EACH CUSTOMER



HYDROPRESS · INC.

ENGINEERS *CONTRACTORS*

HYDRAULIC PRESSES · ROLLING MILLS
STRETCHERS · PUMPS · ACCUMULATORS

570 LEXINGTON AVENUE · NEW YORK · N. Y.

An Inexperienced Operator

PUSHES A BUTTON . . .

CROSS

and HERE'S WHAT HAPPENS *Automatically* -

- **Clutch Housing Bored and Faced**
- **Center Main Bearing Milled on Both Sides**

THIS CROSS SPECIAL MACHINE, by means of three independent but simultaneous feeding motions, straddle mills the center main bearing of an automotive cylinder block, and bores and faces the clutch housing—at the rate of 30 pieces per hour at 80% efficiency.

More than that, this machine enables inexperienced or unskilled operators to maintain close tolerances. The work cycle is fully automatic and functions without attention. Labor costs per piece are low. Large-volume production is obtained from a small floor area. Cutter breakage and scrap losses are minimized by means of interlocking electric controls.

Milling, facing and boring are thus combined into one fully automatic operation on a Cross *Special Machine* that *anyone can operate.*

The idea behind the design of this machine is the idea behind all Cross *Special Machines*... removal of metal at lower cost on equipment that operates at the push of a button. It is a principle that can be applied to any type of machining operation, a principle that is in successful use all over the world.

Cross Engineers are available to survey your present machining methods and, if special machines can lower your costs or help solve your manpower difficulties, they will design, build and install the machines for you, and show your workmen how to operate them.

The new Cross Catalog contains 38 detailed case histories of successful Cross *Special Machines.* For your copy, write on your letterhead to The Cross Company, Detroit 7, Michigan, Department 24.

Special Machines •

for automatically performing any one or a combination of metal cutting operations

TURNING · MILLING · DRILLING · BORING · REAMING · TAPPING · GRINDING

METRO

. . . precision and accuracy not only help to win the war but also help to set a higher standard of craftsmanship wherever Metro Standard Gages and Carbide Tipped Tools are used—not only now but after the war too. Designed and made under exacting specifications, they are intended to meet working conditions equally exacting. Standard Gages and Carbide Tipped Tools are available for immediate delivery from your Metro distributor. Let Metro engineers help you when you need special gages and tools for special jobs.

Standard Gages

Carbide Tipped Tools

Write for New Metro Catalog No. 102 Today

METRO TOOL AND GAGE CO.

4240 Peterson Avenue
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HERE'S ALLIS-CHALMERS' GREAT NEW V-Belt Team!

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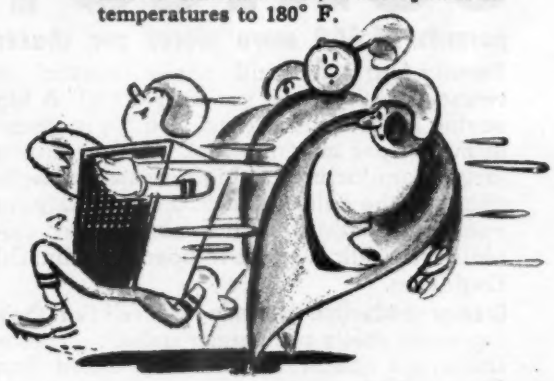

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THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI, OHIO, U. S. A.

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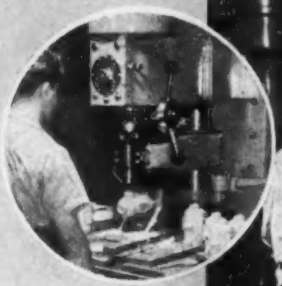
WHEN hundreds of different aircraft parts come to the battery of Warner & Swasey Precision Tapping and Threading Machines in the Dayton plant of United Aircraft Products, nearly all required machining has been done. Now, all that remains is accurate tapping to proper depth and the piece is ready for inspection and assembly. But it is a precision job—the straight tap or tapered pipe thread must meet class 3 fit, and tap depth must be held to ½ thread to pass Army Air Corps specifications. Inaccuracies now mean *a reject of the piece, and the loss of all the time-taking machine operations which have gone before.*

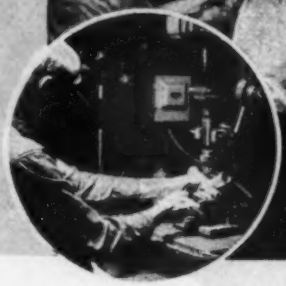
It is truly a "make or break" operation, and United Aircraft Products, as one of the very first users of Warner & Swasey Precision Tapping and Threading Machines, has found these new and improved machines invaluable, eliminating rejects, scrap loss, tap breakage, while speeding production of vitally needed parts.



Inset view shows tapping of an aluminum aircraft strainer body—a ⅛"-27 pipe tap with depth held to ½ thread. Production 60 pieces per hour.

A battery of Warner & Swasey No. 12 Precision Tapping and Threading Machines cuts internal threads on hundreds of United Aircraft Products parts.

Another battery of Warner & Swasey No. 11 Precision Tapping and Threading Machines cutting class 3 thread fits on a high production basis.



Inset view showing a Warner & Swasey No. 11, tapping "Y" drain valve; ⅛"-27 tapered pipe thread with depth held to Army Air Corps requirement of ½ thread. Production 60 pieces per hour.

Your Warner & Swasey representative will be glad to explain the patented lead screw principle and many other advantages of this revolutionary tapping and threading machine. It can aid war production now, and put you in better position for postwar competition. Write for catalog.

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TURRET LATHES · SADDLE AND RAM TYPES · CHUCKING AND BAR TOOLS · TAPPING AND THREADING MACHINES

Reconversion of Men

THIS IS A MESSAGE for all metal-working shop operators, big or little. It doesn't matter whether you are in Massachusetts or in Iowa or in Texas or in California.

You are less than human if you are not giving some thought to the reconversion of your plant to peacetime operations, though you may still be up to your ears in war work.

You are laying your plans regarding what you are to make, what kind of plant equipment you must have, what proportion of your present machinery can be reconverted, and what kind of organization you intend to have.

You are concerned about future markets and whether you are going to get your share of them.

But have you thought about the problem of converting men, a problem that is likely to be with you soon?

We might as well face the fact now that thousands of young men will be coming back from the war with a serious handicap of one form or another. Perhaps the discharged man will be minus a leg or an arm, or his hearing will be impaired, or his sight defective, or he will have trouble coordinating his muscles and controlling his nerves.

The government will take care of these men, of course. Unless they are hopelessly disabled, however, they won't want to be dependent upon the nation permanently, even if the nation should be eternally indebted to them for what they did.

They rightly will want to earn their own living as soon as possible. They will desire jobs. The test of the nation's gratitude will not come with the provision for hospitalization or rest cures or pensions or training courses, but in the ability to provide jobs fitted for them.

A great responsibility reposes in industry to see that they get the kind of job that they can do. The responsibility does not stop with merely offering an existing job intended for anybody physically fit. It carries over into the task of helping to set up positions that minimize the handicaps and maximize any newly-acquired skills that the disabled veteran may possess.

You may say, "What is there that I can do now about this problem?" The answer is that there is a great deal that you can do. You can make a systematic inspection of your shop and of your office to ascertain suitable jobs for handicapped men.

You can study your plant equipment to find out what portion of it can be adapted, perhaps with minor changes, to operation by a disabled service man.

The problem isn't complicated, it isn't involved. It is a simple one that requires a little time and effort. It should not be neglected because it doesn't seem pressing at the moment. If you let it go now, it will be upon you before you know it.

A few plants have made a happy start on this phase of reconversion. Some of the larger corporations have gone so far as to appoint physio-therapists to their staffs to aid the returning service men get readjusted. There has been talk in some cases of redesigning machines so that handicapped men can operate them with ease. Other plans with the same general objective are in the making.

The point is that the problem will be only partially solved if the large majority of metal-working shops sit back and let a handful of big companies try to do the entire task.

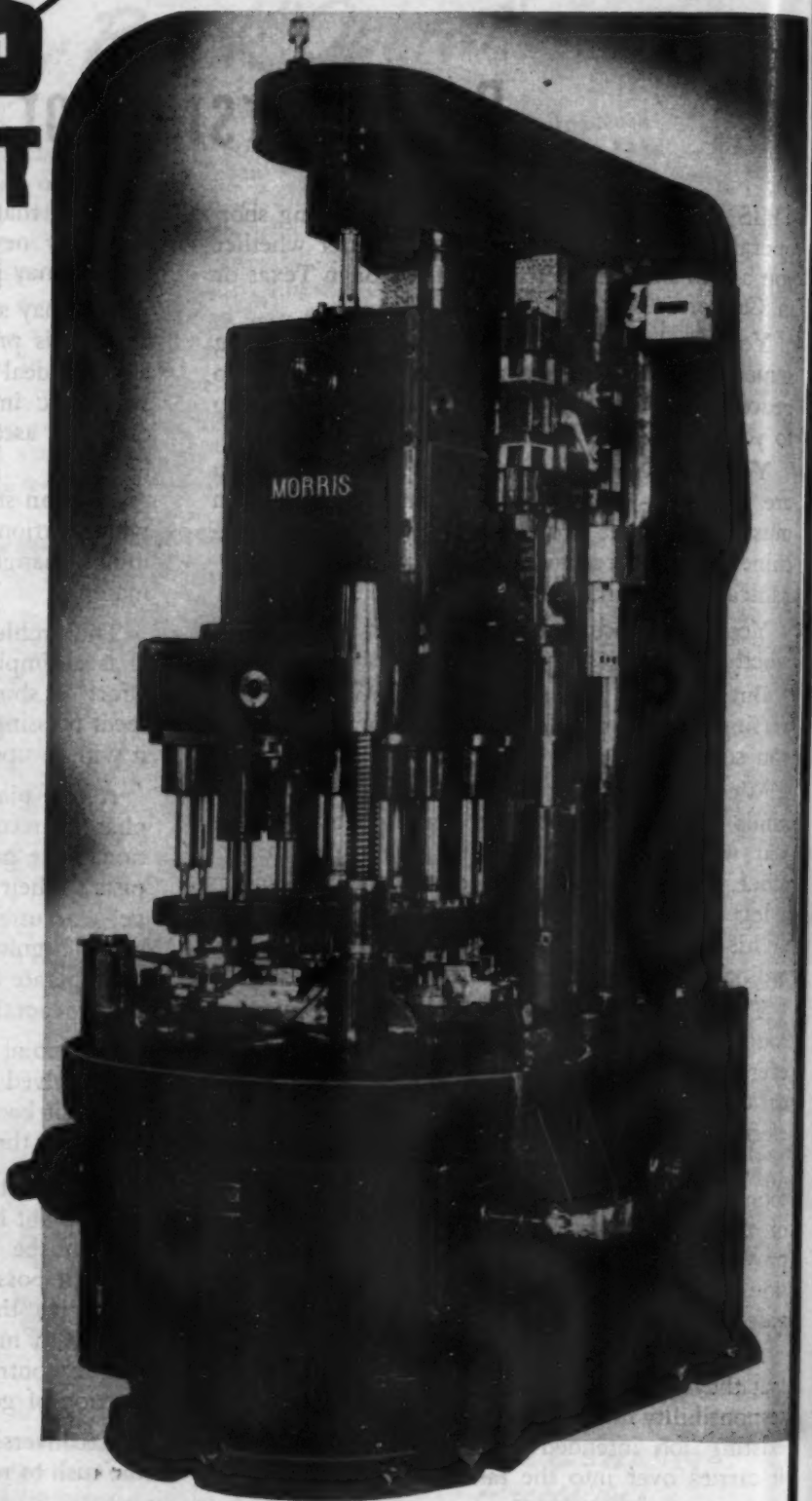
This is a task that calls for action on the part of every plant in the country. It is time that good intentions be translated into a program that will make it possible to give jobs to disabled men that will give them an opportunity to earn a good living, to maintain their morale and self-respect, and to contribute their share to the country's production of goods.

Reconversion of men must not be forgotten in the rush to reconvert plants and equipment.

Burnham Finney

MORRIS EQUIPMENT

Automatic Specialized



This machine was developed by Morris engineers to accurately drill, ream and counterbore steering wheel hubs on a mass production basis for a nationally known automobile manufacturer.

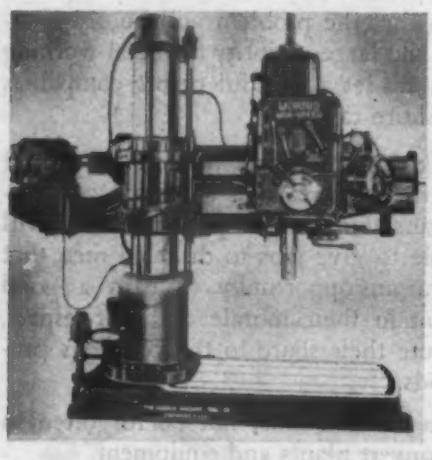
Illustrated is a 4-station, vertical, automatic indexing machine with standard, self-contained, hydraulic feed unit operating 14 spindles. It also has a built in cutting lubricant system and automatic clamping fixture.

The self-contained hydraulic feed unit is unique in that it can be used in any position and provides a wide variety of approaches and returns as well as feeds and speeds — and is fully automatic.

By merely substituting a different drill head and fixtures this machine is easily and quickly made adaptable to other jobs.

An organization skilled in the manufacture of special equipment — an engineering staff experienced in the design and development of special machines for mass production of specific jobs is available at Morris Machine Tool Co.

Consult them on your plans for high production of specialized work.



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What's Ahead in Forging

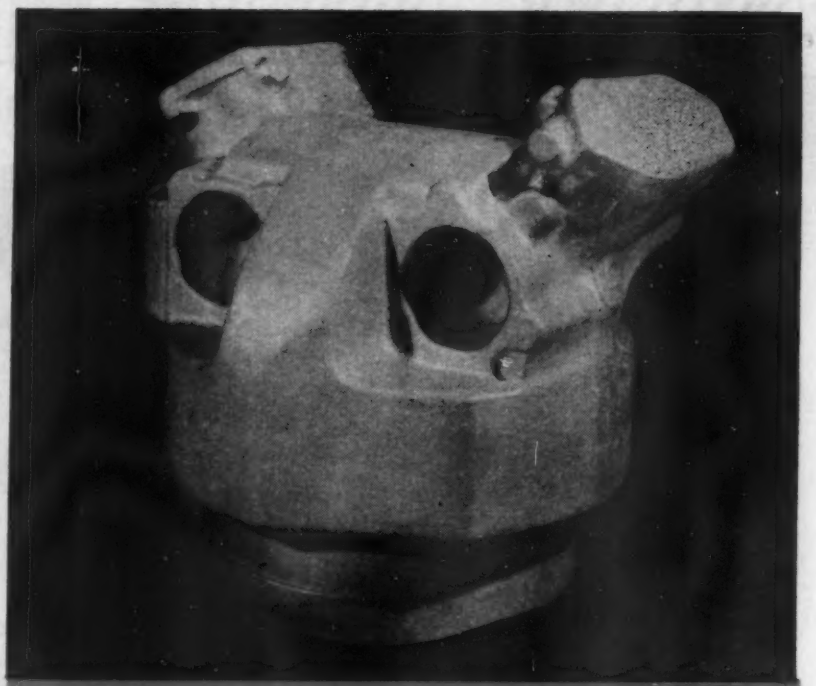
WAR HAS SEEN a great advance in the quantity and quality of forgings produced in this country, a great modernization of forging equipment, and many companies and individuals are becoming familiar with the production of forgings and the qualities such forgings possess. All of this foreshadows a great forging capacity in the future which will probably result in forgings being applied in many fields and on many products where they have never before been used.

There has been some change in the production picture during the war, which has seen some items that were formerly forgings replaced by castings and stampings, but generally, forgings have increased in number and type because of improvement in the technology of forging, the growth of new forging processes, and the importance of forgings in war products.

Regardless of what may be developed in metal forming, it is almost as certain as death and taxes that forging will always play a most vital role in the industrial scene, because no other metal forming process can provide the strength that is imparted to metal by forging—a strength that with-

Metal Working Tomorrow

—Forging practice has been improved considerably in meeting war production demands. The modernization of equipment and enlarged forging capacity will be a big factor in spreading the use of forging to many fields hitherto unexplored



Closed die forging on hydraulic presses has resulted in production of such parts as this aluminum cylinder head. Extra strength from forging resulted in a 15 percent increase in power rating

stands extremely high stresses for long periods.

Part of the upsurge in demand for forgings stems directly from ordnance items such as shell, guns and tanks, but a large demand comes from the wartime needs for such products as ships, planes and trucks. With our great shipbuilding and aircraft production facilities and an increased automotive market, it seems certain that the demand for forgings after the war will be much greater than in any other previous peacetime era. The forging of aluminum and magnesium alloys for aircraft use caused an advance in forging technique that will undoubtedly have permanent effect upon metal working.

Typical of the increased use of forgings is the Flying Fortress. This plane has so many forgings in it—more than 3,200, exclusive of ball bearings—that it has often been referred to as the Flying Forging. In it there are forgings of all sizes, types, shapes and metals.

When this country entered war production, its forging capacity was seemingly ample, but the demands of all out war production showed not only that our capacity was really low, but also that our equipment was woefully out of date. Careful estimates showed that at the war's start 88 percent of the hammer capacity of the country was more than 10 years old. Almost superhuman effort on the part of makers of forging equipment has resulted in correction of this situation, although forgings are still on the most critical list of war requirements.

The most spectacular advance in forging has come in the field of press forging. Here, it was a case of trying most anything that would give even faint promise of helping to produce the vitally needed forged parts for ships, tanks, planes, trucks, shell and many other important equipment. Considerable persuasion was needed to convince the powers that ruled war production that press forgings would be entirely satisfactory for producing war goods. That press forgings are more than satisfactory is proved conclusively by the number of installations of this type of equipment and the types and numbers of forgings they are producing.

More Accurate Heating Coming

Other advancements in forging include better and more accurate heating of billets, bars and blanks; more scientific and better design of dies; advancement in closed die techniques; an increase in the general knowledge of what happens and why in producing a forging; and the ability to produce forgings, even in large sizes, which have only about 1/16 in. of metal to be removed in subsequent machining operations.

Forging has long been an unpleasant, dirty, noisy and relatively expensive process, but steps are being taken to correct some of the conditions which make this situation true. Further changes

in this direction will occur in future years when attention can be paid to these matters rather than strictly to the problem of producing more and more forgings faster and faster.

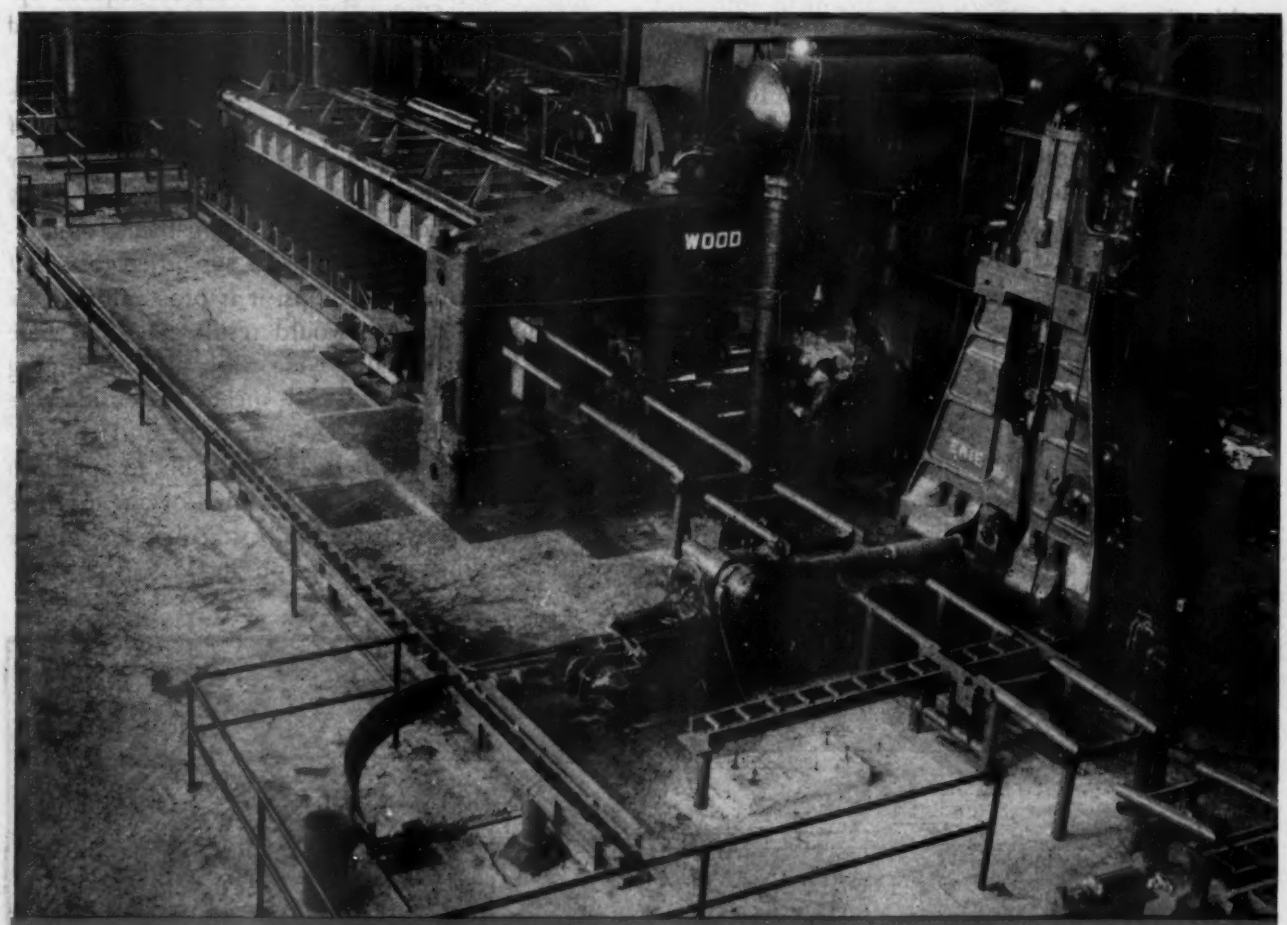
With the exception of the changes which are coming in a further growth of hydraulic forging presses and various types of forging machines, there is little to be expected in the way of new equipment. Forging hammers have been of the same basic designs for many years, and there is little cause to believe that there will be any startling, radical changes, except in the case of control over pressure and stroke of the ram, which is evident in the newer hammers.

Cost of forgings will be reduced in many ways, not only through reduction in the cost of the actual forging, but also in other pertinent costs. Much of this cost reduction will come with a spread of knowledge of forging techniques and the taking of steps towards standardization of methods, but even more savings are likely to come through a reduction of cost incidental to machining the forging.

One of the most wasteful elements in forging has been the matter of scale formed during the heating and hammering of the forged metal. Scale makes it necessary to provide more metal stock at the outset to be certain that enough sound metal would remain for the finished product. Scale is often pounded into the dies during actual forging, ruining them for further use unless repaired, and in other cases, the scale is pounded into the parts themselves, sometimes making it necessary to scrap the part, before or after machining.

Fight on Against Scale

For many, many years scale was considered as one of the necessary evils of forging and little was done to try to halt its formation. Now some of it has been eliminated and there are research projects afoot to control the formation of scale still further. A large share of this improvement is due to better heating practice. Controlled atmosphere furnaces, induction heating machines and molten heating baths of various types are now used in the forging field to heat the stock before forging. In



One of the important steps forward in forging is the combination of two or more forging processes. In this set-up tubes are fed to an upsetter from the furnace, and then are finished in the hammer at the right

addition to providing better and cleaner heat, this type equipment provides more control over the forging temperatures and insures uniformity. Indications are that such heating will be vastly extended in the era ahead. In addition, there will be an increased utilization of automatic furnaces of the roller hearth, rotary hearth, pusher and conveyor types in such a way that properly heated billets, bars or blanks are delivered at exactly the right time and temperature to a point very close to the hammer, press, bulldozer, upsetter or forging machine.

The goal of one research program is the extension of controlled atmospheres to the forging equipment proper. When and if this is done, the battle to control scale will be just about won. To apply such atmospheres to presses and some forging machines does not seem to be too much of a problem, but doing so with the huge, open hammers will be quite another story. It is a certainty that attempts in this direction will not be abandoned until every possible avenue has been explored. At any rate, scale and its consequent cost will not continue to be tolerated without some sort of battle against it.

There will be more cases where a combination of forging processes are combined to produce parts.

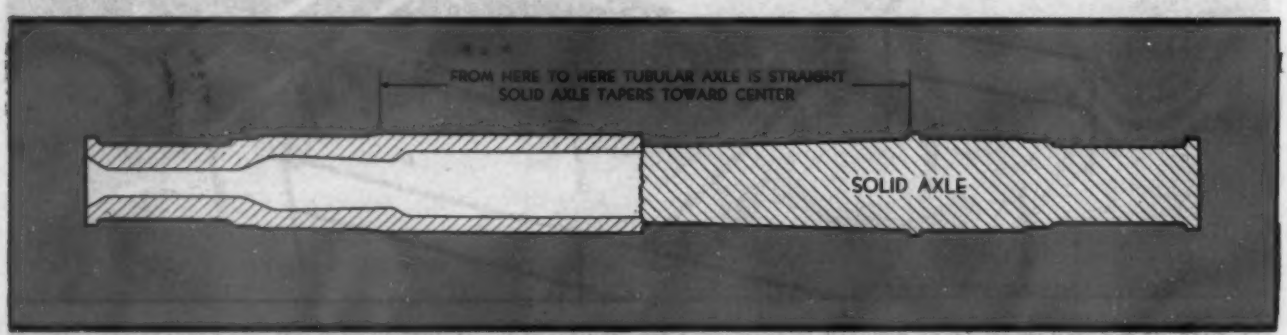
A second manner in which the cost of forgings will be reduced is in the use of less material to provide a given quantity of forged parts. This will come about in many ways. Typical of the type of development which will make this prediction come true is the case of a railway axle recently placed in production. These axles are now produced from forged seamless tubing, rather than being made from solid steel bars forged to shape. By combining several forging processes, these axles are made to provide the strength needed to withstand terrific stresses at the points where they occur without wasting metal where it is not needed. This type of development will continue and savings will be extended to other products of a like nature.

Other savings in material cost will come with a further improvement in die design and in the design of products which are to be forged. It is true that many parts are now much larger and heavier than would be necessary. This situation comes about through a desire to insure proper strength in the forging. Knowledge of metal flow can provide this strength in many cases with considerably less metal than was once thought to be needed. This has already been done in the aircraft field, where, among other things, lighter and more carefully designed forgings have helped reduce total plane weight to less than one pound per horsepower.

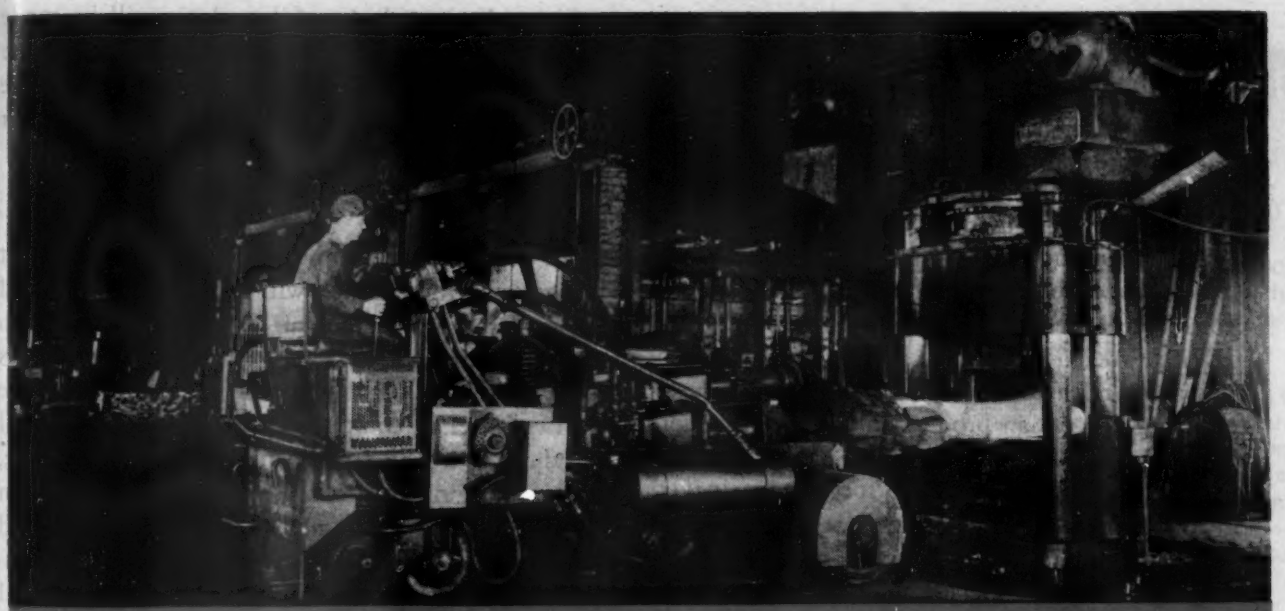
Standardization and a general spread of forging knowledge will result in better, cheaper forgings.

Likewise, better die design will result in less machining on forged parts. For various reasons, some metal must be removed from the usual forging, but if the amount to be removed is small, there is a decided reduction in cost of material, machines and manpower. Close tolerances will be maintained on forging dies as they now are on plastic molds and die casting dies. Thus subsequent operations on the pieces can be standardized and speeded through better tooling.

Perhaps one of the most beneficial moves in the forging field is an attempt at standardization of many factors and practices. Now, and for many years past, forgings are made in almost as many ways as there are plants producing them commercially. Were a drawing to be submitted to a half dozen different forge shops, it is probable that six different die designs would result and that there would be an equally wide variance in forming methods. This necessarily means a considerable difference in price. Therefore, there is a well-founded belief that if it were possible to approach standardization of both dies and forging practice there would be consequent cost reductions, higher quality forgings and faster production.



An interesting example of a trend in forging is this tubular railroad car axle. Here are shown halves of a solid axle and the new one made of forged tubing. The new axle gives ample strength where needed, and is cheaper



Material handling methods will improve in forge shops along with equipment of all types. Here in a modern shop, a tractor is used to take a bar from the furnace and hold it during forming in a flat die press

It is safe to predict that many improvements in forging will come in the next few years, as there has arisen some strong competition to this method of shaping metal. Of course, castings have always competed to a certain degree with forgings, at least in those instances where stress requirements of the part were not too great. However, during the present war stampings have come forth as strong competitors to forgings. In some instances a number of small stampings have been joined by welding and brazing to form a part once made from a forging, with completely satisfactory results. As a matter of fact, a group of stamping experts worked with ordnance officers for many months to determine where and how stampings could replace forgings. Now, many ordnance items are ordered with alternate sets of specifications—one set for forging and the other set for stamping.

Forgings Increase Aircraft Power

However, there has also been a trend in the opposite direction to offset some of the inroads of competition. For instance, the aluminum cylinder heads of radial aircraft engines were castings for many years and now a large number are being produced as press forgings. Reports on one such cylinder head claimed a 15 percent increase in horsepower rating for the same size head, thus making possible a redesign of the entire engine, increasing its horsepower with a slight decrease in the weight to horsepower ratio. There are other cases where castings and stampings have been changed to forgings because of a desire to reduce weight, lower machining costs, eliminate welding, reduce inspection time or lower scrap losses.

Another improvement in forging technique which opens wide possibilities in connection with the use of closed dies is known as centrifugal forging. The steel bar is rotated in the dies during reduction so that excess metal is extruded into a gate rather than being forced into a gutter surrounding the die impression. This results in a forging which has no flash or parting lines. The method is being used to produce parts with high quality finishes such as piston pins, counterweight pins and impeller gear shafts and is specified to control grain flow and eliminate cracking in steel later heat-treated to extreme hardness.

Complicated Shapes With Closed Dies

Knowledge has been gained of the forging of rather complicated shapes by the closed die method by means of pressing. Before the war, shapes produced in this manner were rather simple and usually symmetrical. When hammer capacity was taxed to the limit, study of the design was encouraged to make possible the use of forging presses on intricate steel designs. Within limitations as to size and shape, forgings of brass, copper, aluminum and magnesium are produced economically and well on presses, chiefly because of the excellent extrusion properties of such metals. Each step or operation is completed in one long squeeze of the metal in the tooling used. In press forging a single is handled, rather than a bar.

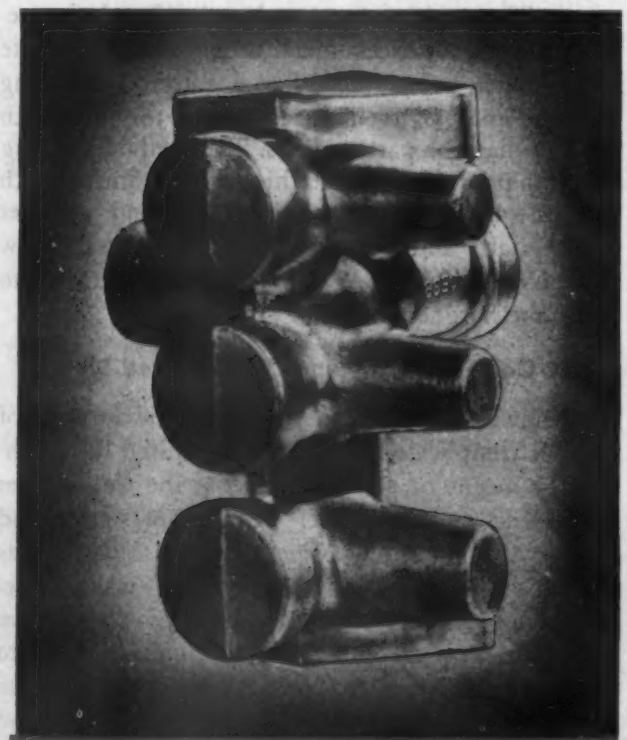
In searching for ways to produce some forgings faster, a successful attempt was made to substitute flat die hammers for drop hammers. This forging method was often used when there was no time to wait for drop forging dies to be made—periods ranging from 10 to 20 weeks. The flat die method has also been used to produce experimental models of forgings without going to the expense of sinking dies. Here is a forging method which will probably be used more and more on short runs.

With greater forging capacity and superior equipment released from war duty when industry reconverts to civilian production there will be considerable scrambling for business to keep this capacity busy. This will result in forge shops, makers of forging equipment and trade associations engaging in extensive research work and educational campaigns to spread the gospel of forgings and why and where forgings should be used. **Men concerned with the future of the forging industry are already eyeing possible applications of forging in fields that have thus far resisted using them to any large extent.** For instance, many farm implements that have used castings extensively may be designed around forged parts. The theory being that it will be better to pay a little more for the equipment if it is built so that costly breakdowns will be eliminated. Careful analyses will be made in other fields and on other products to see where forgings logically can be used. In other words, the initiative will be taken by forging people rather than waiting for forgings to be specified by.

Shops to Have Variety of Equipment

In the matter of shop equipment, it is likely that progressive forge shops will be equipped with all types of forging equipment—board and steam drop hammers, presses, upsetters, and forging machines of various sorts—rather than concentrating on one or two types of equipment and trying to adapt all production to the equipment on hand. Likewise, much of the rule of thumb judgment will pass from the field and forging methods will be determined largely by metallurgical knowledge and tested engineering principles combined with the practical experience that is of equal importance.

Following the war it is likely that there will be a continuance of the trend towards combining forgings and stampings through welding and brazing. At first glance this might look as though the result would be a reduction in forging production, but this need not be so, as it can result in parts not now benefiting from forgings, having forgings incorporated in their design.



Many small parts that were once castings now can be made economically by forging. This aluminum manifold for a plane's oxygen system suggests applications in many fields

Here is another small part that is being forged, rather than cast. New closed die techniques can produce parts that require a minimum of final finishing operations

Worn Lathe Spindle Repaired by Welding

OF THE HUNDREDS of unusual repair jobs done by arc welding because of emergency war conditions, one of the most interesting was described in a recent account received by The Lincoln Electric Company, Cleveland, Ohio, from E. L. Richardson, superintendent of the Machine Shop Division, Henderson & Lathrop, Inc., Auburn, N. Y.

The repair consisted of reclaiming an excessively worn spindle of a turret lathe, the threaded end of which had become so badly galled that the finger holder could not be moved and had to be split in order to remove it from the spindle. About 7/8 in. of the threaded portion (the normal engagement area) was damaged. The spindle has an outside diameter of 3½ in. with an inside bore of 2 7/16 in.

Although it might have been possible to obtain a new spindle, this would have necessitated a long delay and subsequent tying up of the machine in dismantling and re-assembling in addition to the extra cost of the part. However, the repair was made during one day shift and the lathe was used on the night and early morning shifts as a chucking machine.

The worn section of the spindle was first turned down with the temporary cutting tool arrangement. The holder was fabricated from scrap steel parts welded together. The main bar, 2 7/16 in. in diameter by 16 in. long, was arranged to form a smooth sliding fit in the spindle hole and was extended by a piece of 1½-in. bar stock for coupling with hole in turret for longitudinal travel. The boss, welded to the flat bar, was given a 1½-in. bore so a standard toolholder could be used.

By revolving the spindle against the tool, the old worn threads were removed about ⅛ in. below the root, the only tool motion being that for longitudinal feed.

After removal of the old threads, the worn surface was built up with two passes of 5/32-in. shielded arc electrode for mild steel. The weld beads were laid longitudinally on the spindle. Possible warpage was prevented by welding at intervals and wet cloths were applied to the portion of the part not being welded so as not to draw out the temper of the metal.

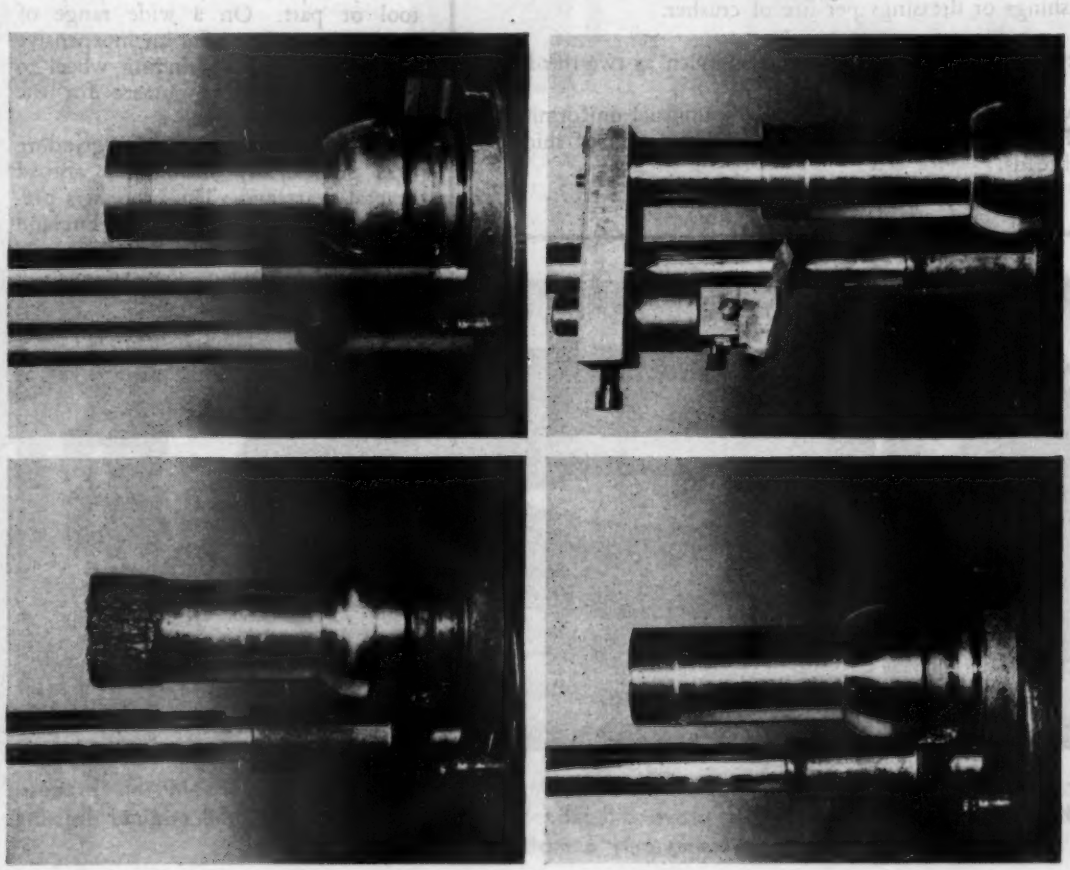
Excess weld metal was then removed by employing the cutting tool as was used to remove the threads, the part being thus machined to its original outside diameter.

The same temporary cutting tool arrangement was used to turn and thread the spindle after spindle section had been restored to proper diameter. For this operation, the toolholder was driven longitudinally from the cross-slide so that the threading hob could be employed. The rigid construction of the cutting and threading device avoided the possibility of chatter marks on the finished threads, resulting in a perfect fit. The weld metal showed no pin holes which would permit entry of fine dust or scale and perhaps start another gall.

Following is a break-down of the time necessary to complete this repair:

Turning time (prior to welding)	1 hr.
Arc welding time	3 hr.
Cutting threads and finishing	3 hr.
Honing inside of spindle	1 hr.
Total time	8 hr.

The only replacement necessary for the entire job was a new finger holder, it having been necessary to destroy the old part in removal.



Steps in repairing a worn lathe spindle, shown upper left, are removing worn thread (upper right), by means of a special tool arrangement; building up the end by welding (lower left), and then machining down to original diameter and re-threading (lower right), using the same tool as was used to remove original threads

Crush Forming Speeds Production Of Ground Contours

BY JOHN HAYDOCK, MANAGING EDITOR, AMERICAN MACHINIST

★ Hard steel rollers can be used to dress abrasive wheels to a wide variety of shapes, which in turn can be transferred to the workpiece in a grinding machine ★

Advantages of Wheel Crushing and Full-Form Grinding

1. On varied and intricate profiles, full form crushing fashions the entire wheel to the desired shape in a fraction of the time required by conventional dressing methods.

2. A better cutting surface is provided with more free-cutting points on the grinding wheel.

3. It increases the number of pieces ground per dressing, instead of requiring redressing after every wheel pass. Judging by results, the wheel bond retains its strength and adhesiveness.

4. Cost of dressing tools is slightly reduced because of quantity of pieces ground per wheel dressing and because of the large number of crushings or dressings per life of crusher.

5. Actual grinding time is often reduced as much as two-thirds.

6. On threads it makes commercially possible unusual uniformity of thread, lead and pitch diameter, as well as elimination of thick first and last threads.

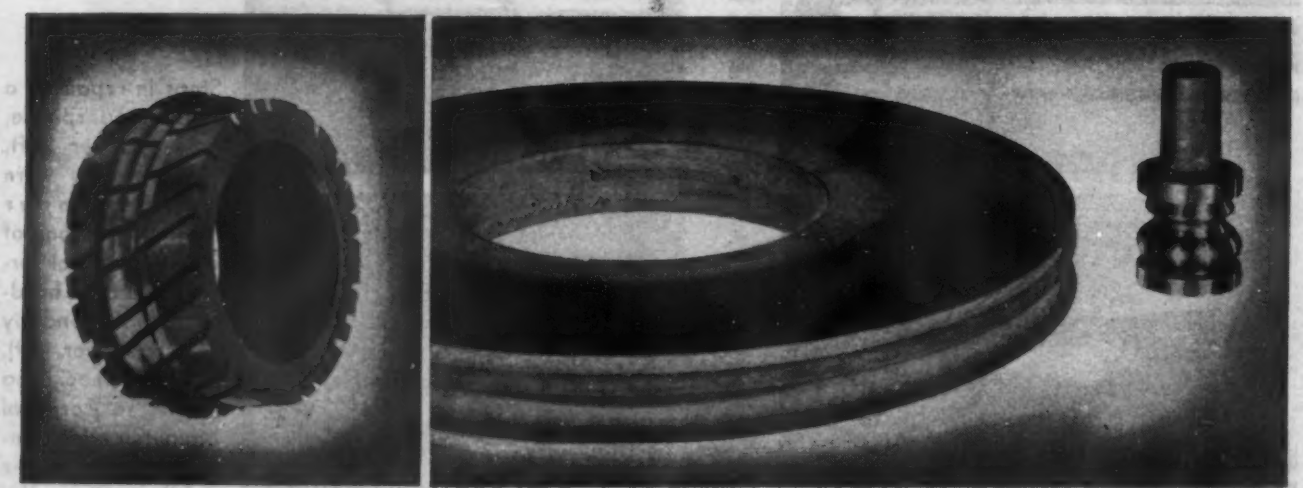
CRUSH FORMING is the process of shaping abrasive wheels so that the contour produced can be transferred to the workpiece during a grinding operation. Since the process is usually done with hardened steel rollers, it is often called roller dressing or roller forming.

Grinding with crush-formed wheels has not been general practice in the United States but has been used abroad for a number of years with notable success. It speeds machining of many kinds of contours on work such as circular and flat forming tools, die segments, broaches, other irregular profile tools and gages as well as production parts.

Wheel Crusher Built Into Grinder

Grinding machines incorporating wheel-crushing mechanisms make it relatively easy to grind even an awkwardly shaped, flat or circular precision tool or part. On a wide range of applications, they offer an inexpensive way of dressing a grinding wheel to get a better cutting surface for the most intricate shapes.

Plunge form and thread grinding was successfully introduced abroad several years ago. The process is preferred practice today is both England



Here are a crusher roller, a formed wheel and typical contoured part to illustrate the steps in this process. Diamond dressing the wheel to this shape would prove difficult. With the crusher method, the original dressing is rapid and redressing only a matter of seconds

and Europe. In the United States some grinding operations, such as those on ball bearing races, have utilized this method.

Combined American and English experience discloses that in the present stage of development, three machine tools complement each other to provide full utilizaiton of wheel crushing and plunge form and thread grinding techniques. They are:

1. The microscope form grinder for manufacturing and inspecting flat or cylindrical original masters, as well as general profile tools and parts of wide variety and shape.
2. The plunge full form and thread grinder for fast high production parts such as threads and intricate forms.
3. A good surface grinder for rapid high production of flat tools and production parts utilizing the crusher roller method of wheel dressing.

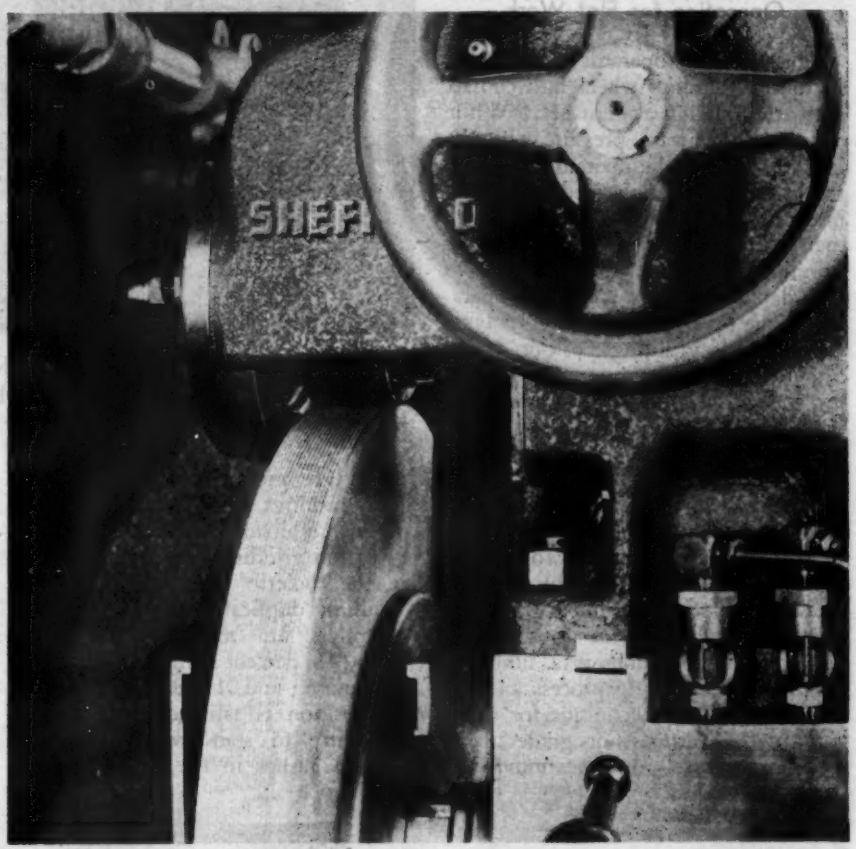
Used in combination, these machine tools have a wide application in production departments and in the modern toolroom and tool plant.

Duplicate Dressers Easily Made

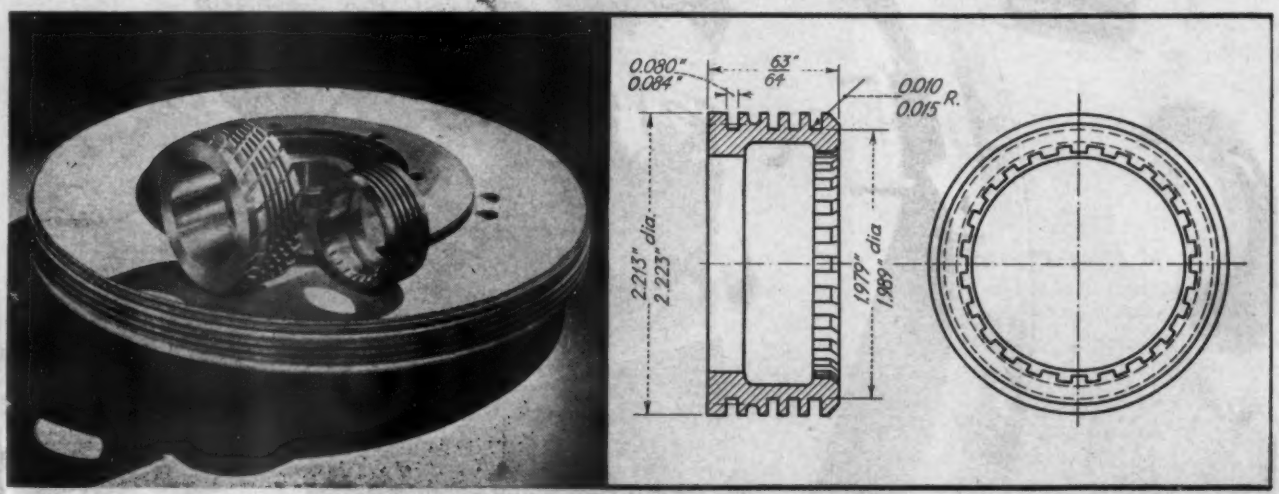
After the microscope form grinder produces the first or original wheel crusher dresser, additional crusher dressers for production parts or tools can be reproduced at a fraction of the cost of the original on the plunge full form and thread grinder by roller forming its wheel to the desired profile and them grinding additional dresser rollers in the quantities necessary.

While such a machine reproduces wheel crushers, it is primarily a production machine for producing cylindrical parts and tools that are ground by the formed wheel dressed by this same crusher method. The crushed grinding wheel will produce almost any kind of odd-shaped cylindical parts, form tools or threads as readily as it reproduces original crushers. Its use eliminates dressing after every wheel pass.

On flat work the wheel of a good surface grinder can be dressed by crusher rollers originally produced on the microscope form grinder or reproduced on the plunge thread and form grinder. The grinding wheel of the surface grinder is crushed originally by using a crusher roller assembly mounted on a surface grinder table. This unit consists of a power driven



The crusher roller of a plunge form and thread grinder is lowered by a handwheel to transfer 20-pitch threads to the grind wheel. After the coolant is turned on, the grinding wheel is started and by friction rotates the ball-bearing mounted crusher roller



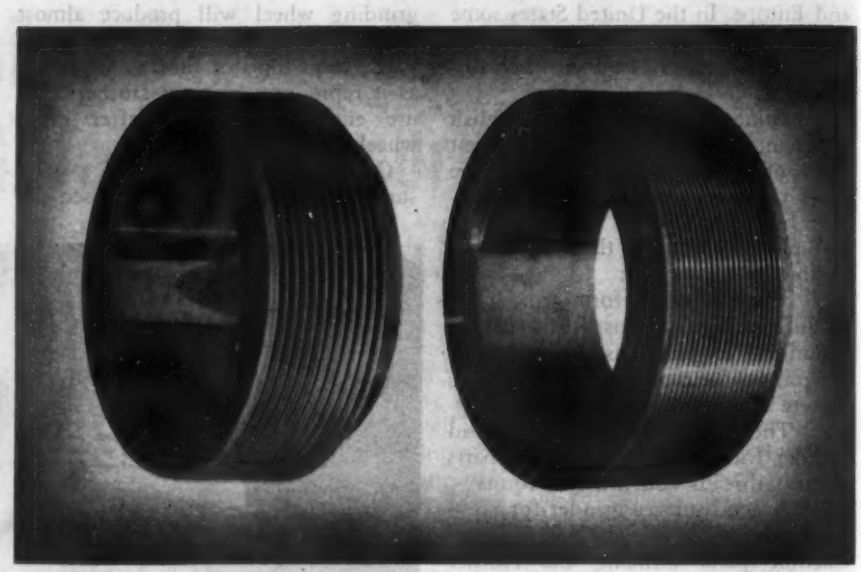
Originally the grooves on this part were finish ground with a diamond-dressed single-point wheel—time 17 to 20 min. Use of a crusher-dressed wheel reduced grinding time more than 70 percent. Roller, dressed wheel and workpiece are shown

dresser roller at one end with provision for mounting any loading fixture within machine capacity on the other. Its size provides for a variety of dresser rollers, and it can readily be used for redressing the wheel whenever wear makes it necessary.

Operation for Flat Work

Initially the operator lowers the stationary grinding wheel into contact with the stationary crusher. While retaining downward pressure with the lowering wheel, the operator starts the roller motor and easily feeds the wheel into full form depth. Slightly more than one complete revolution of the grinding wheel, after penetrating to full depth, ends the crushing operation. The operator then traverses table to the work grinding position, shutting off the crusher motor and starting the grinding spindle. Almost any flat form grinding job can be mounted on this standard assembly, and similarly, the same assembly can be reused for other work whenever the run on one set-up is completed.

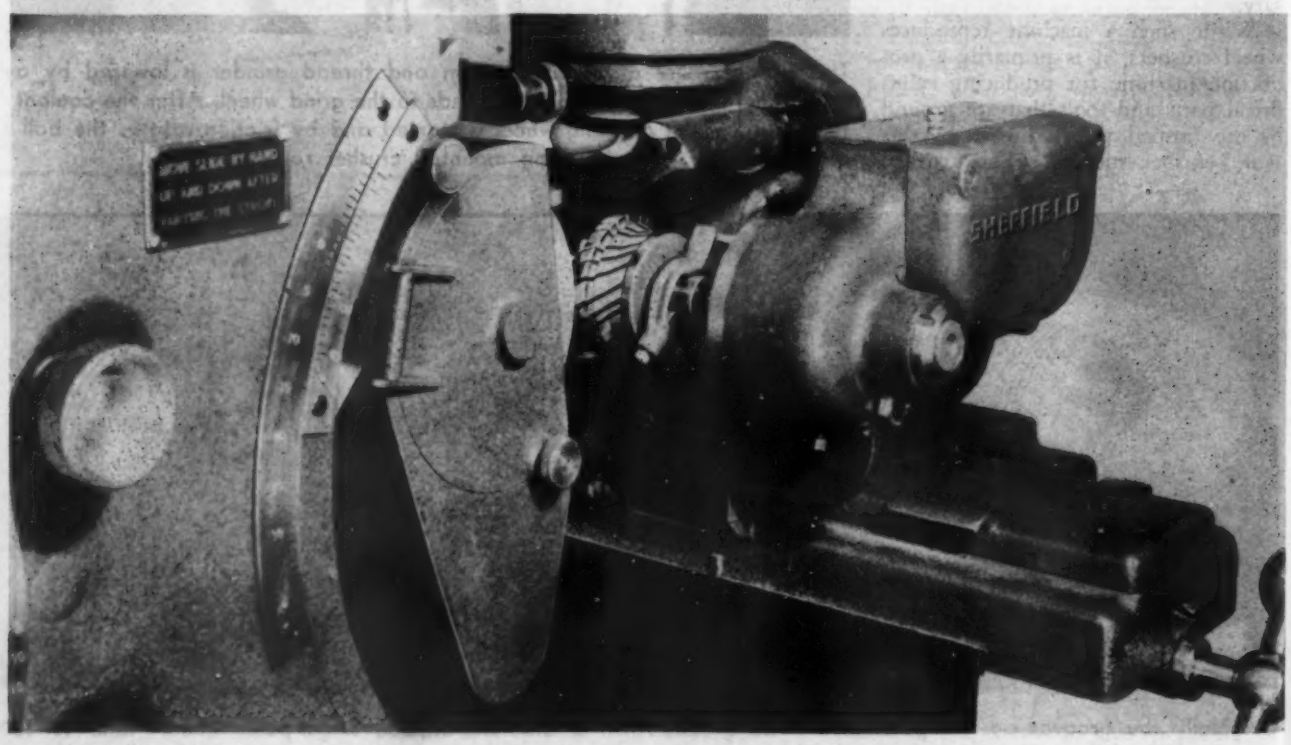
The pressure required for wheel crushing is remarkably light and emphasizes that the effective hardness of a grinding wheel is due in part to its rotating speed. There is a similarity between this crushing process and the often used testing technique for determining the hardness or grade of all grinding wheels. A large number of pieces are ground between dressings and crushings. For regular and periodical production runs, a roller-dressed full form grinding wheel can be stored in the toolcrib for future use, thus avoiding duplicate initial recrushing.



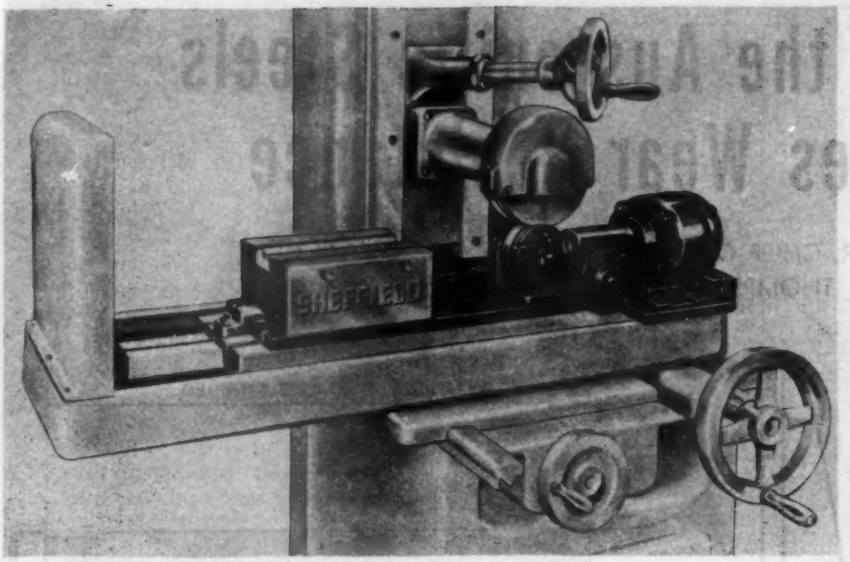
These crusher rollers have threads with no lead and are made without gashes. Each point of the V's transferred to the grinding wheel acts as a single-point tool. On coarser threads the crusher can be gashed to give chip clearance

Rollers are made of high-speed steel (18 percent tungsten, 4 percent chromium, and 1 percent vanadium composition is satisfactory) hardened according to standard tool practice. Helical gashes in the rollers are frequently used as it was formerly thought that they were needed as clearance channels for the abrasive removed from the wheels. Recent experiments have proved, however, that solid rollers are satisfactory for most contours.

Speed of rotation during crushing should be about 300 surface ft. per min. The same cutting lubricant used in the grinding operation can be used for crushing although a heavy oil is preferable.



Crusher rollers can be produced on a miscroscope form grinder. The work is revolved while the wheel is ground optically along the contour with the help of a 50:1 pantograph and a 30-power miscroscope



The wheel of this surface grinder is crushed by a power-driven dresser roller for producing flat formed work. This reverses the process used on the cylindrical grinder where the abrasive wheel is power driven and drives the roller by friction. A vise at the other end of the fixture holds the workpiece

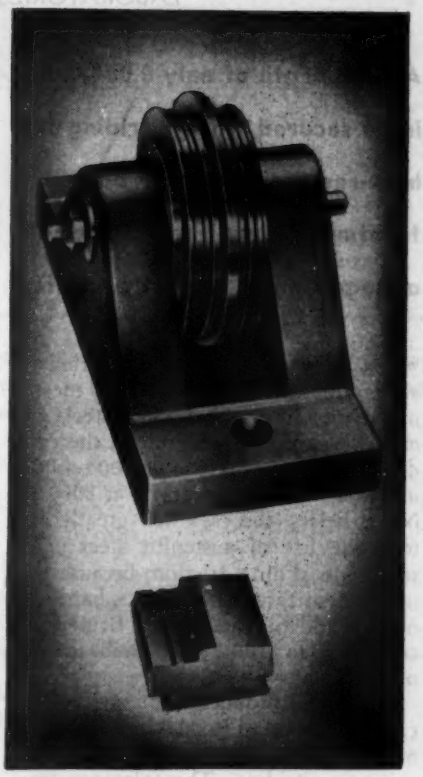
Either aluminum oxide or silicon carbide vitrified grinding wheels can be roll crushed. A medium grade is best with grits from 150 to 220.

For form cutting, grinding wheel speeds should be approximately 1725 to 2500 r.p.m., assuming a wheel diameter of about 12 in., and the workpiece should rotate from 150 to 200 r.p.m.

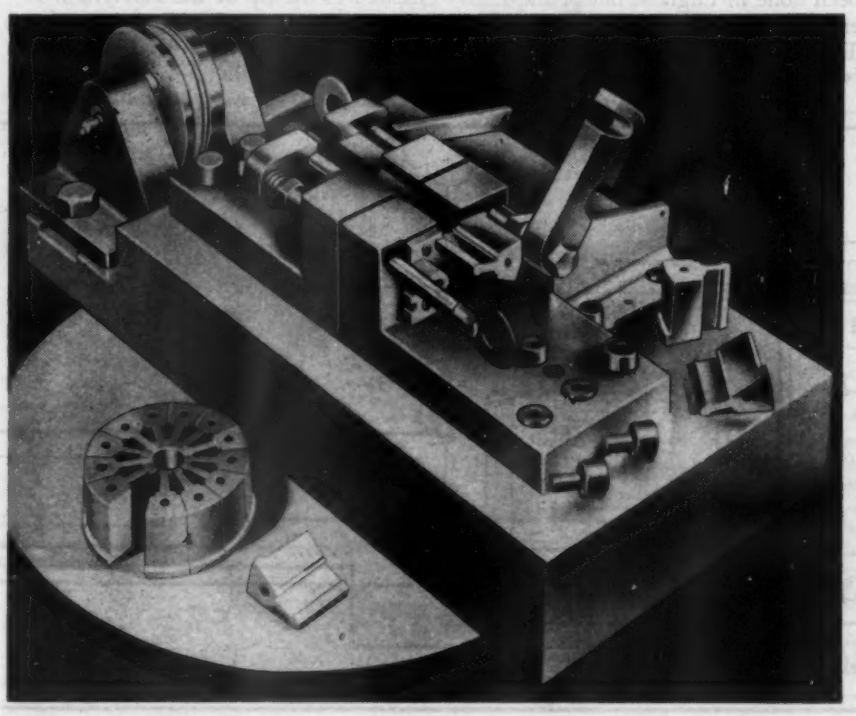
Plunge and Traverse Grinds

Threads are ground by crush formed wheels in one of two ways—by plunge grinding and by traverse grinding. Plunge grinding is especially useful on short threads. It involves infeeding the abrasive wheel to depth and then rotating the workpiece about 1 1/3 revolutions, with the feed mechanism set for the proper lead.

Traverse thread grinding follows conventional thread grinding methods except that a multiple-grooved wheel is used in place of the single-point wheel. The wider wheel improves rigidity and prevents errors in the thread caused by lateral displacement of the wheel especially when making and leaving contact with the workpiece at the end of the thread. The multiple cutting point tends also to average or iron out any possible error and so increase uniformity and decrease the likelihood of "drunken" threads. This method can be applied to pieces of any length within the capacity of the grinding machine.



A double crusher roller, mounted in its holder, is used to dress a wheel for grinding the flat tool shown below. As the roller form on one side of the central flange becomes worn, it is used for rough dressing while the other half is available for finishing

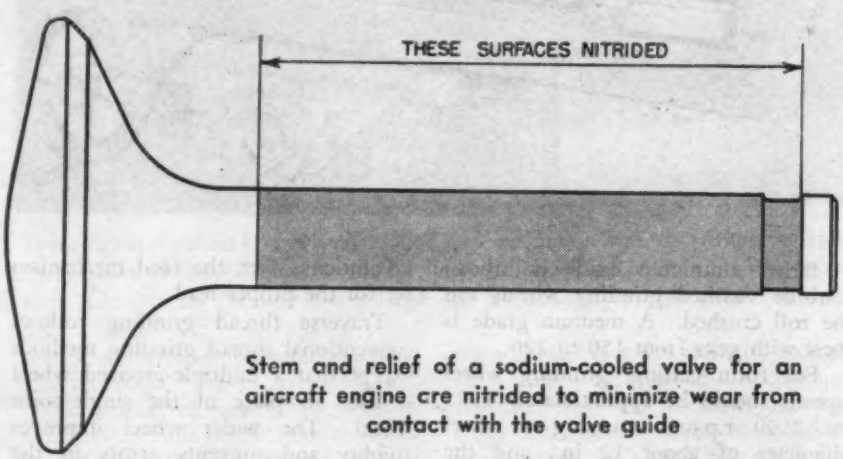


This fixture is used to grind the formed groove in a die segment. The workpiece is located by a dowel and a lug, and is positioned so it will be ground with the proper longitudinal clearance. A central pivot permits swinging the fixture to either side to center during grinding to provide clearance on the side of the grooves. This is a good example of English practice. The crusher roller is mounted at the far end of the fixture

Nitriding the Austenitic Steels Improves Wear Resistance

BY I. A. BINDER, CHIEF OF METALLURGICAL AND CHEMICAL LABORATORIES, THOMPSON AIRCRAFT PRODUCTS COMPANY

A case depth of only 0.004-0.005 in. is secured when nitriding the heat-resisting steels, but this treatment gives these materials a longer life if subject to friction



Stem and relief of a sodium-cooled valve for an aircraft engine cre nitrided to minimize wear from contact with the valve guide

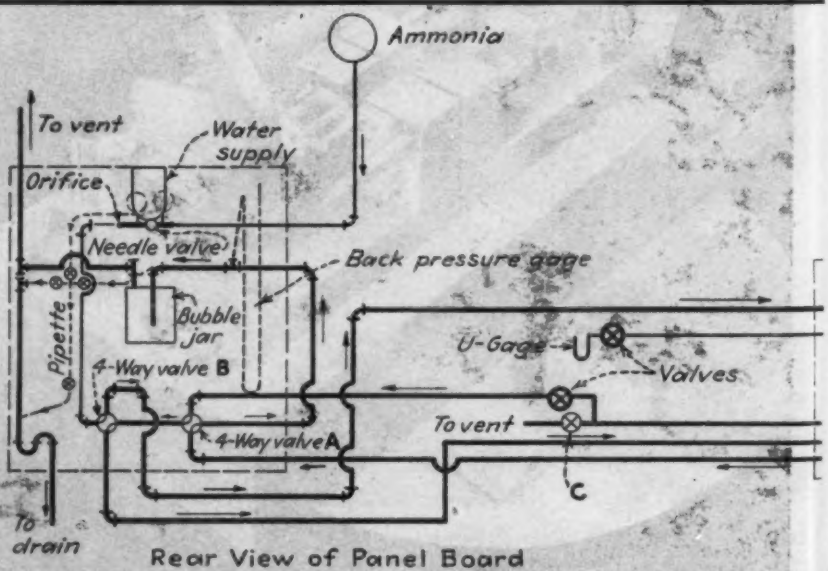
WEAR RESISTANCE can be imparted to austenitic heat-resisting steels by means of the nitriding process. Such steels are more sluggish than Nitralloy; the case depth that results is only 0.004-0.006 in. for a 50-hr. heating cycle at 1000 F. Nevertheless, the case will greatly extend the life of austenitic steel parts subject to sliding friction, because the nitrided surface will show a hardness of 750 and higher Vickers Brinell, as compared to 190-230 Brinell in the original state.

Successful production of such a thin case is predicated upon careful control of size when machining the product prior to nitriding. The tolerance may well be set at 0.0005 in. If this is maintained, the final grind to remove the softer top layers of the case will compensate for the growth of the part during nitriding. Growth usually amounts to 0.001 in. per 0.5 in. of product diameter. The hardest layer of the case, and the one best for a bearing surface, lies 0.0005-0.001 in. below the nitrided surface. The objective therefore should be to establish quality standards that will insure retention of a case depth of 0.004-0.005 in. after a finish grind of 0.001-0.0015 in. from product diameter.

The nitriding of austenitic steels has been done in England but perhaps less extensively in the United States. The Thompson Aircraft Products Company is, however, using the process to case-harden the stem of an exhaust valve used in a certain aircraft engine. This component is made of a steel possessing this analysis: chromium, 13 to 15 percent, nickel, 13 to 15 percent and tungsten 1½ to 3 percent. Brinell hardness of the steel is from 190-230. The valve seat is hardfaced with Stellite No. 6 to resist a temperature of 1200 F. or more, in addition to wear and corrosion. A hard-steel tip is flash-welded to the tip of the valve stem to resist tappet wear. Straight section between the head and tip is nitrided to a depth of 0.004-0.006 in. to minimize

OPERATION	Position of Valves	
	A	B
Box No.1 In Furnace Purging Box No.2		
Box No.2 In Furnace Purging Box No.1		
Box No.2 In Furnace Box No.1 Empty		
Box No.1 In Furnace Box No.2 Empty		

As Seen From Front of Panel



Rear View of Panel Board

wear from sliding in the valve guide.

Because of the nature of the metal, preparation of the valve for nitriding is a special problem. The steps are as follows:

1. Tinplate valve 0.0003-0.0005 in. thick. The plate must be adherent.
2. Grind plate from stem and retainer neck.
3. Remove grinding coolant with a vapor-spray degreaser.
4. Place rubber cap on tip end of valve.
5. Clean electrolytically and wash.
6. Nitride.
7. Grind, removing 0.001-0.0015 in. of stock from stem diameter.

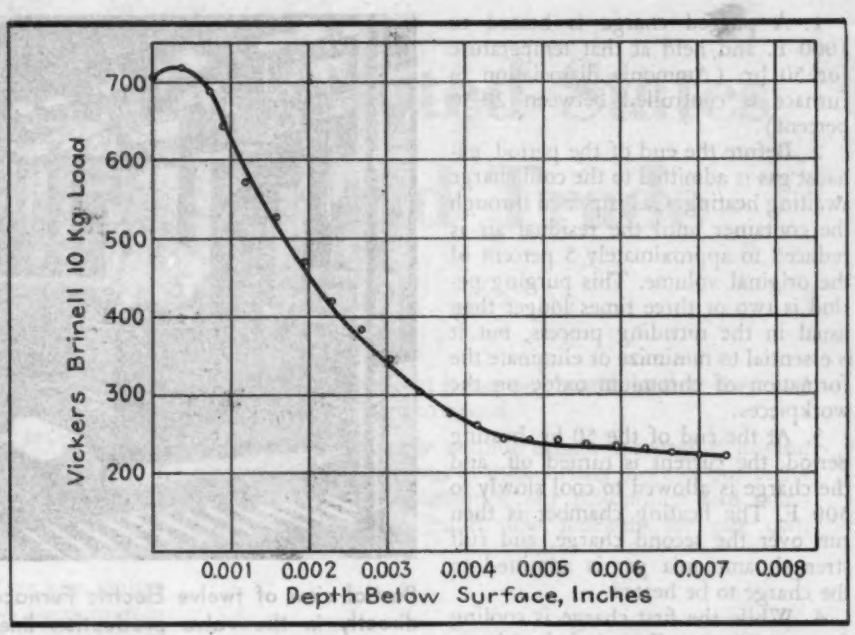
Electrolytic cleaning removes any trace of chromium oxide, a substance that seriously interferes with the nitriding process.

Nitriding is carried out directly in the production line. Racks of cleaned valves move along a roller conveyor to twelve Electric Furnace Company batch-type furnaces arranged in two rows. Lateral conveyor sections assist transfer of the work to the charging stations.

As is customary in the operation of box-type nitriding furnaces, the heating chamber is moved on rails to either of two positions. Thus, one charge can be heated while the other is cooling. Six-hundred exhaust valves constitute a charge. They are carefully spaced in the alloy box to prevent touching and nicking.

Condition of the furnace must be better when nitriding austenitic steel than when handling Nitralloy. Work containers must be made of a special alloy. The original material specified for boxes had a life of only 20-30 heats: the satisfactory metal has a life of 1½ to 2 years.

The nitriding cycle is carried out in this manner:



Surface hardness of austenitic valve steel nitrided at 1000 F. for 50 hr. Because of the shallow depth of the case, the true surface hardness is higher than the curve indicates

SCHEMATIC PIPING ARRANGEMENT FOR NITRIDING FURNACE

Heavy black lines denote valves and piping added to the original layout to permit purging Box No. 1 and Box No. 2 with compressed air. Ammonia fumes are piped out of the plant.

Valve *C* must be open when placing or removing the cover on a box. This requirement also applies when the box is subject to rapid heating and cooling, as when the box is placed in or removed from the furnace. Valve *C* must be closed immediately when the U-gage indicates little or no pressure.

Air-Purging Cycle (after nitriding cycle is completed):

1. Shut all valves in ammonia lines (inlet, exhaust and U-gage).

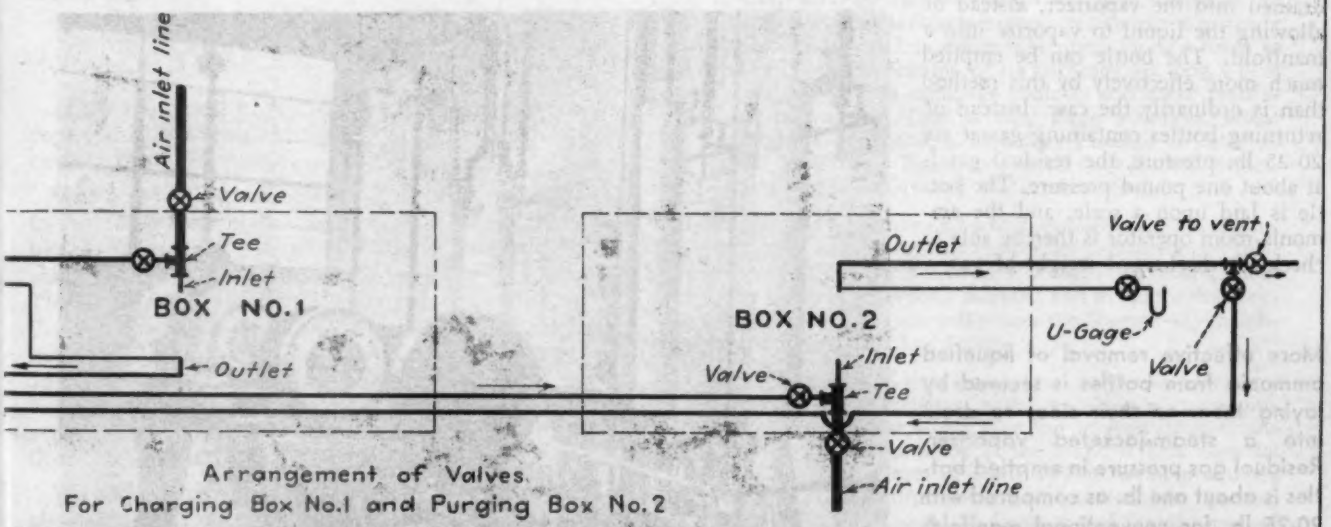
2. Open vent valve (valve on line to outside atmosphere).

3. Open valve on compressed-air inlet line.

4. Fans in nitriding box are left in operation.

5. Purge box to remove all traces of ammonia gas.

6. Shut off air valve and fans. Open box and remove nitrided charge.



Arrangement of Valves For Charging Box No.1 and Purging Box No.2

1. A purged charge is heated to 1000 F. and held at that temperature for 50 hr. (Ammonia dissociation in furnace is controlled between 20-30 percent).

2. Before the end of the period, exhaust gas is admitted to the cold charge awaiting heating. Gas is passed through the container until the residual air is reduced to approximately 5 percent of the original volume. This purging period is two or three times longer than usual in the nitriding process, but it is essential to minimize or eliminate the formation of chromium oxide on the workpieces.

3. At the end of the 50 hr. heating period, the current is turned off, and the charge is allowed to cool slowly to 500 F. The heating chamber is then run over the second charge, and full strength ammonia gas is admitted to the charge to be heated.

4. While the first charge is cooling from 500 to 250 F., it is fed with exhaust gas from other charge to minimize formation of temper oxides on the nitrided work pieces.

5. Before the cooled charge is opened, it is purged with compressed air. The purged ammonia fumes are piped outside the shop.

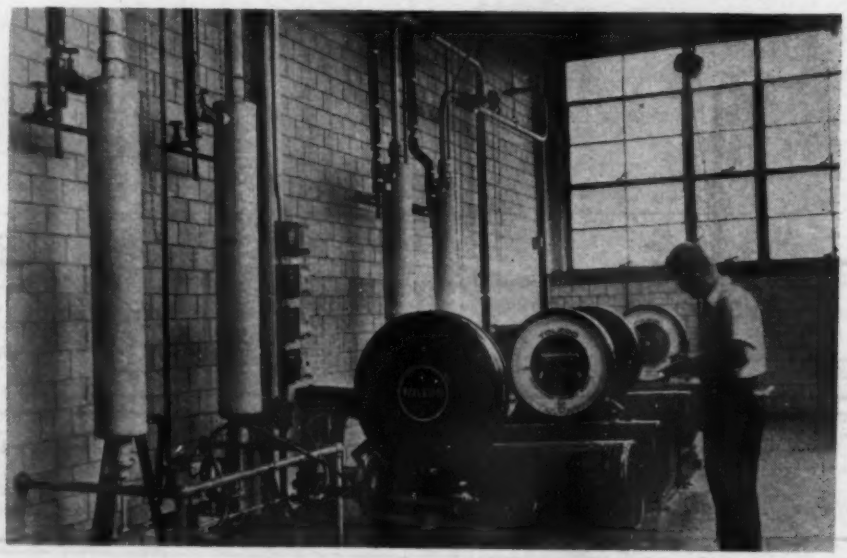
It is imperative that ammonia should not escape to the shop atmosphere either during purging of work boxes and discharging of nitrided work or as the result of an accident in removing gas from purchased bottles. The fumes, even in slight amount, might prove bothersome to furnace operators, and to other operators in the production line.

Effective Ammonia Use

An ammonia room is located outside the shop and gas is piped to the nitriding equipment. Each gas bottle is connected to a vaporizer, or steam jacketed chamber. The liquified ammonia is drained into the vaporizer, instead of allowing the liquid to vaporize into a manifold. The bottle can be emptied much more effectively by this method than is ordinarily the case. Instead of returning bottles containing gas at say 20-25 lb. pressure, the residual gas is at about one pound pressure. The bottle is laid upon a scale, and the ammonia-room operator is thereby able to check the discharged weight of gas.

Partial view of twelve Electric Furnace box-type nitriding furnaces installed directly in the valve production line. Each furnace handles 600 valves

Racks of electrolytically cleaned valves proceed down the conveyor (foreground) which serves two banks of nitriding furnaces.



More effective removal of liquefied ammonia from bottles is secured by laying them on their sides to drain into a steam-jacketed vaporizer. Residual gas pressure in emptied bottles is about one lb. as compared with 20-25 lb. for conventional manifolds

The *Stake* of the United States in Expanding World Trade

WITH the war in Europe racing to a climax, and with a sure pattern for the defeat of Japan already outlined, American business is confronted with the need for an immediate decision on long-term economic policy.

What is this country's foreign trade program to be after the war?

No intelligent appraisal of all the factors any longer can allow us to postpone considering the issue merely because, in the past, foreign trade absorbed barely eight per cent of our production.

Actually, a whole new set of conditions was injected into the picture by the first World War; but we persisted in ignoring these new factors.

Almost overnight, the United States was transformed from the largest debtor nation in the world to the second largest creditor nation. At the same time, we made faster technological progress than any other nation. Thus we created the need for more dollar exchange on the part of the rest of the world and simultaneously made it harder for other nations to earn dollars.

Today, as another, far vaster war is approaching its end, those changed circumstances are magnified. America has new responsibilities—to itself, and to the world.

Our war-inflated industrial capacity cannot be allowed to drop back to prewar levels without causing a domestic crisis which we dare not permit.

And, because so much of the world is geared to the American industrial machine, we can no longer contemplate calmly the repercussions of a largely self-sufficient trade program or of an unplanned foreign trade program. Either would inevitably set the stage for the next world war.

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If we are going to prepare ourselves intelligently to cope with this new problem, we must acknowledge certain basic principles.

World trade cannot be rebuilt simply by attempting to restore *prewar* flows of goods. The war has so completely changed the economic fiber of many countries that it is necessary to develop *new* trade relationships. The East Indies, for example, may find the demand for their rubber considerably reduced; the United States may, to a large extent, have to cease exporting cotton; Japan will need to find new substitutes for much of its exports of silk; the British will need new markets to replace the income which they formerly derived from their large overseas investments.

We cannot expand markets for our goods, at home or abroad, unless we find ways of buying more supplies from more people at home or abroad, so that they will have more dollars to spend.

And we probably cannot create increasing buying power abroad without first exporting more of our technical skills—our engineers, our production and management men—to build new markets for our own specialties.

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What is needed to rebuild the world's economic system?

1. Most basic of all, of course, are stable governments which command popular support. In the absence of strong governments, currency stability cannot be achieved.

2. Most war-stricken countries, for a year or two, will need rehabilitation loans, because they will require far more raw materials, equipment, and live stock than they can pay for out of current production.

3. Loans, however, are only a stop-gap, though often a necessary one. Far more important than rehabilitation loans will be the creation of better opportunities for war-stricken countries to sell to the rest of the world, particularly to the United States, South America, South Africa, and India. The ravages of war do not completely destroy the ability of a country to sell. Indeed, it is surprising what large supplies of certain commodities war-torn countries have on hand even before devastated industries have been restored. The invading troops in Normandy found shoes almost non-existent, but they found food more plentiful than in Britain.

   Better opportunities for war-stricken countries to sell would create opportunities for them to buy the things they will require to restore scattered industries and depleted farms, and would help those countries to get rid of the exchange controls which are now universal. So long as a country is able to expand its exports only slowly and painfully, and is dependent upon foreign loans to prevent the depreciation of its currency, so long will it carefully preserve exchange controls and other restrictions in imports. That is why large advances, either through an International Monetary Fund or an International Investment Bank, can make only limited contribution to the removal of trade restrictions.

4. Permanent monetary and credit arrangements are needed to protect nations against temporary pressure upon their currencies, to permit necessary changes in exchange rates to be made in an orderly manner, and to assure that governments never again will repeat the "beggar-my-neighbor" policies of 1931 and 1932.

5. Finally, the world needs a reversal of the trend toward economic self-sufficiency, which received a strong impetus from the first World War and an even stronger one from the great depression of the Thirties. This does not mean that the efforts of many raw-material producing countries to diversify their industries should be opposed. During the late Nineteenth Century and the first part of

this century, the international specialization of production was carried too far, with the result that many countries became dependent for a large part of their standard of living upon the export of one or two raw materials—coffee, sugar, rubber, silk, wheat, wool, and meat. Between the two World Wars, however, the pendulum swung much too far in the direction of self-sufficiency. Some densely populated industrial countries of Europe (Italy, France, and Germany) even attempted to become self-sufficient in wheat, fats, and sugar. So limited are the natural resources and technical skills of most countries that each one finds many things which it can produce only at prohibitive costs. Between the extreme specialization of the late Nineteenth Century and the more recent trend toward extreme self-sufficiency, a happy medium should be sought.

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What role should the United States play in reconstructing the world's international economic system?

There are those who suggest that the United States be a more or less permanent Santa Claus. They believe that an excess of exports could be financed only by "loans"—loans that would eventually turn into gifts, after producing bitter controversy over why the "debtor" country did not meet its obligations. The persons who assert that full employment can be provided only by an excess of exports are in effect saying that our economy cannot become self-supporting. That is a confession of economic defeatism which a young and vigorous nation should not be willing to make.

The most immediate contribution which the United States can make to world reconstruction is to make itself prosperous.

Prosperity here means a large demand by our industries for imports. The more we import, the easier will it be for foreign countries to meet their large and urgent needs for goods. In 1939, with a gross national product of $100 billion, our imports were $3 billion. After the war, with 55 million people employed and a gross national product of $155 billion, our imports would be about $7 billion or $8 billion.

Not only should the United States make itself prosperous, but it should *keep* itself prosperous. *So important is the United States in the world economy that a depression here is bound to produce a disastrous drop in the price of raw materials throughout the world and to throw most countries into an economic tailspin.*

The United States should support the principle of a large fund to protect the exchanges of the world from temporary pressure. We should not permit differences over the details to prevent its establishment in ample time to be available during the critical period when war-stricken countries will need goods far in excess of their immediate ability to pay for them. *Some* arrangement, even though imperfect in details, will be infinitely superior to no arrangement.

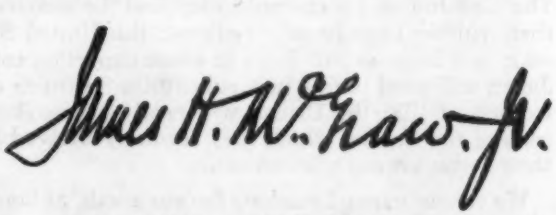
Finally, the United States should take the lead in breaking down barriers to trade. We are the logical country to do this, partly because of our immense domestic market, and partly because for most of the last twenty-five years this country has been able to sell other countries more goods than they have been able to sell to us. One of the greatest contributions which the United States could make to a sound and expanding world economy would be to bring our imports, as soon as practicable, up to our exports. *In other words, the United States, in the long run, should be hard to borrow from but easy to sell to.* The United States should implement this policy (1) by continuing the negotiation of reciprocal reductions in duty, and (2) by accepting exchange rates which make foreign currencies cheaper in dollars than they were in 1939. So great will be the world's need for goods that we can be sure that any dollar exchange earned by sales to us will be converted into American-made goods and will lead to larger exports.

Time was when the United States obtained about eight per cent of its standard of living by sending goods abroad and bringing back other goods. Before the war, however, we were getting less than five per cent of our living by international trade. If, after the war, we were gradually to raise the proportion of our standard of living obtained by trading with other countries to ten per cent of domestic production, our imports would be about $15 billion or $16 billion a year. Our people would be able to buy many things which they now cannot afford, and scores of countries which export raw materials and luxury products would feel the stimulus of rapidly expanding markets. Their expanded demand for road building machinery, mining machinery, machine tools, agricultural implements, locomotives, railroad cars, electrical equipment, trucks, automobiles, and a multitude of products of our factories would create a million or more additional jobs in our factories.

Although the United States would raise its standard of living by increasing its imports and its exports, it should honestly face the fact that the resulting shifts in production and employment would temporarily be painful for some people. The increase in imports would be in commodities which other countries can produce for less than the cost at which much of our output is produced—such as sugar, wool, copper, some fats and oils, wines, winter vegetables and fruits. The increase in our exports would come from those industries in which our superiority is greatest—particularly the manufacturing industries. Finally it would be advantageous, to the country as a whole, to shift a million or two workers from agriculture, where they earn about 60 cents an hour at best, to manufacturing, where they earn better than 80 cents an hour.

☆ ☆ ☆

The very fact that in economic matters the rest of the world is dependent upon the United States, exposes our country to great demands and to envy and misunderstanding. The United States must be willing to help the rest of the world, but its help should take the form of assisting other countries to help themselves. Never in all history has one country had such an opportunity to give the world a rising standard of living, to foster conditions under which peace flourishes. What greater tragedy could there be than to make the sacrifices which we are now making and fail to seize this chance to create a world of hope and opportunity in which the spirit of goodwill among nations is able to flourish.

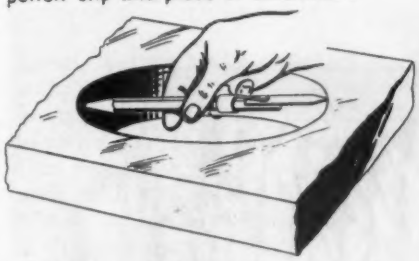


President McGraw-Hill Publishing Company, Inc.

SHORT CUTS FOR THE SMALL SHOP

BY A. H. WAYCHOFF

Inside calipers can be made from a pencil clip and piece of cardboard



CALIPERS for large internal surface can be made from an ordinary wooden pencil and a simple metal pencil clip. To use, the clip is placed in reverse position on the pencil and a piece of stiff carboard, or a thin metal strip, inserted under the tongue of the clip. The clip then can be slid along the pencil while fitting it to the inner walls of the object, whether it is round or square. With a cardboard tongue, this device can be used on objects having overhanging tops, as it will flex without losing the setting.

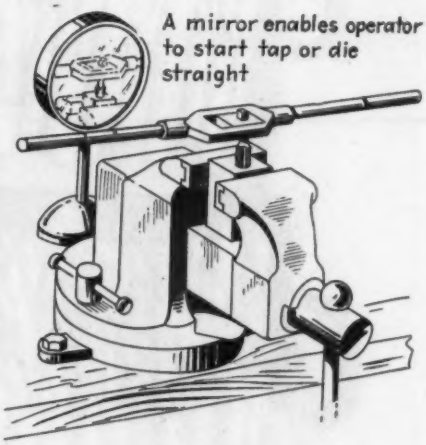
Drilled and slit rubber stopper can be used as depth gage for small drills

DRILL DEPTH gages and stops can be made from ordinary rubber bottle stoppers. One stopper can be used for nearly all sizes of small wide drills. The smallest sized drill is used to drill a hole through the center of the stopper. Then the stopper is split from the center outward to one edge. When prepared this way, the stopper can be placed on any drill within its range and adjusted for the depth of hole desired.

Push the tubing down over the joint causing the jaw to close tightly over the object to be picked up

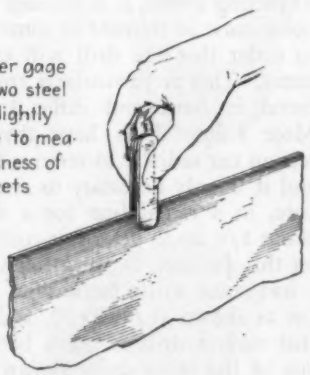
LONG FINGERS for reaching into small places can be made with an umbrella rib, on which the crossbrace is still intact. The single end of the rib is inserted in a piece of small tubing, about 1-ft. long. The ends of the rib and brace are cut to make them even and then flattened slightly to make them serve as jaws to pick up pieces in inconvenient places. To pick the objects out of small openings, the jaws are worked until they open over the object, then by sliding the tube down over the joint of the rib and brace the jaws close tightly and hold the piece so it can be extracted.

A mirror enables operator to start tap or die straight



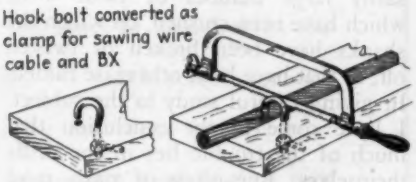
STARTING DIES and taps in such a manner that a perfect thread results can be aided by the use of a small mirror. When working as close to the object as may be required in hand tapping or threading it is difficult to see if the tool is being started straight. A mirror, placed as shown, on the workbench, behind the vise, will enable the workman to see at a glance if work and tool are properly aligned.

Hold a feeler gage between two steel plates of slightly larger size to measure thickness of metal sheets



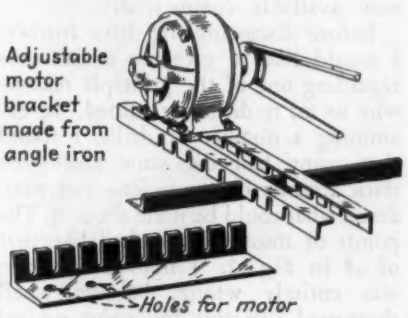
FEELER GAGES can be used to measure sheet metal thickness by using them between two small steel plates. The plates should be slightly larger than the gages used, to provide gaging area. When a sheet is to be measured, a feeler is selected and placed between the two steel plates. When the combination results in a sliding fit over the sheet being measured, the feeler being used will give the correct thickness.

Hook bolt converted as clamp for sawing wire cable and BX



A SIMPLE CLAMP can be made to provide better and easier cutting of steel cable or BX conduit. This clamp is made from a hook bolt, fitted with a lever nut. A slot is sawed in the hook portion of the bolt, deep enough to completely pass through the short end of the hook. Next, a hardwood block is drilled with two holes, one hole for the body of the bolt and the other for the point of the hook. After the bolt is inserted in the block, and the nut run on, the clamp is sued by slipping the cable, wire rope or BX under the hook. The clamp is tightened by drawing up the nut. A hacksaw is used for the cutting operation by inserting the blade in the bolt's slot. The use of such a device will result in a straight, clean cut.

Adjustable motor bracket made from angle iron



ADJUSTABLE motor mounts for small electric motors used to drive bench tools can be fabricated from a few pieces of angle iron. On two pieces of angle iron, about 16-in. long, drill ¼-in. diameter holes about 1 in. from the edge and about 1 in. apart. Next, saw out the holes so they become slots. At one end of each angle iron two holes are drilled, spaced to accommodate the motor base. Another length of angle iron is mounted on the bench to hold the motor support. To use, the motor is adjusted to length, perpendicular to the bench by setting the proper slots on the bench-mounted angle iron. The motor lifts up slightly to put on or change a belt and then its weight gives the belt tension for driving any machine, doing away with need for idlers or jacks.

Practical Suggestions

Advocated here are several new ideas in twist drill design, including a completely different method of driving and chucking

BY GEORGE J. MEYER, PRESIDENT,
GEORGE J. MEYER MANUFACTURING COMPANY

OFTEN DURING the course of trips through the plant, I see an unnecessarily large number of twist drills which have been crushed, on which the shanks have been broken or twisted off, or that have been otherwise ruined. In giving careful study to the subject, I have come to the conclusion that much of the trouble lies in the drills themselves. Regardless of make, most drills have the same weaknesses and characteristics which result in their being ruined before their full life has been realized. I am fully aware, however, that many drills are operated in careless, unmechanical manners.

The matter of drill shanks is of great concern, undoubtedly, in many other shops besides our own. We have an almost unbelievable collection of drills representing most every type of shank. In my opinion, the best, commonly known and used, positive drive is that used on the bitstock drill, such as can be obtained from any manufacturer. Although good from the drive standpoint, these drills have the same weaknesses as all the other drills which are now available commercially.

Before discussing the drive further, I would like to give my conculsions regarding one of the principle reasons why so many drills are ruined. In examining a number of drills, I found that many had the same fault—too thick a center on the point—and wondered what could be done about it. The points of most drills looked like that of *A* in Fig. 2. I figured that this was entirely wrong, because when sharpened like this the point rubbed the metal off instead of cutting it as a tool should. Various methods of thinning were tried and a point such as *B* in Fig. 2 proved most successful.

While running tests on a drill thinning machine, the thought occurred that every lathe tool had to be right on the center to cut to the center. This led to the question of why twist drills were made the way they are, and recalled my apprenticeship days in a railroad shop. The first twist drill I had was one I made myself, in much the same manner as the present twist drills are made, to drill driving boxes. The angle of spiral was about 45 deg. and the thickness of web was about 1/8 in.

When one thinks about a drill and its cutting action, it is realized that the point must be thinned in some manner in order that the drill will enter the metal. This is particularly true if the metal is hard and difficult to cut. Most 3-flute drills have the cutting section cut radially to remove the core, and it is only necessary to remove the core, in a radial line for a depth of about 1/8 in. to get a fair cutting edge on that portion, as shown at *C*, Fig.2. I had some drills made with a radial cut as shown at *D* Fig. 2, and believe that such a drill is much better than any of the other drills shown, including *B*. I claim that all drills should be milled with a radial cut, for no drill does any cutting when running in the opposite direction.

Returning again to the method of holding and chucking twist drills, we frequently twisted shanks from drills when we tried to force the drills through metal. Many standard shanks are unsatisfactory, in my opinion. The best method of holding and driving a drill is by providing it with a positive drive and holding it in a positive drive chuck. To provide such a positive drive, we welded drills onto pieces of hexagonal rod to form a hexagon shank. This provided a good driving means.

Studying positive drives of the Pratt type, I found that drills, especially in the smaller sizes, slipped and damaged screws and jaws of the chucks. It then occured to me that recessed head screws had many advantages over the plain slotted screws and that this principle might be applied to driving drills. In other words, chucks could be made with an internal construction like a screwdriver for recessed head

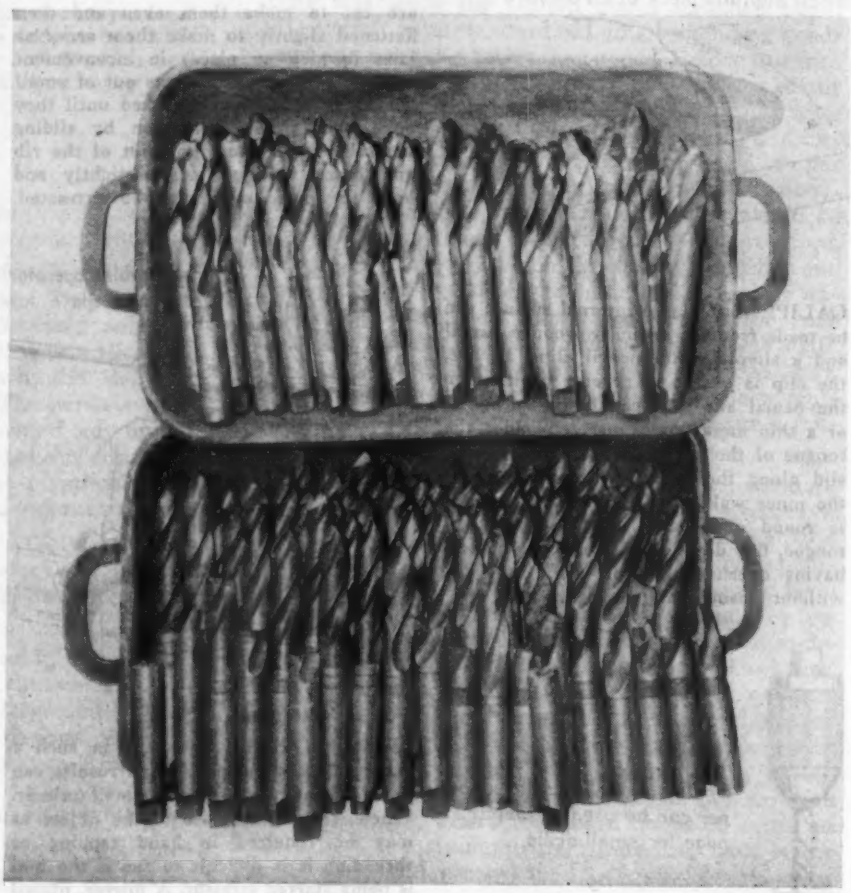


Fig. 1—This is a typical collection of broken and otherwise ruined drills such as might be found in most any machine shop

for Improvement of Twist Drills

Mr. Meyer, who is a successful manufacturer of bottle cleaning equipment, has always maintained a deep interest in the machine shop. This led to his writing some of his ideas on the care, use and design of twist drills. He invites correspondence from those who may try some of the ideas he advances here, or those who might have interesting ideas of their own

screws, and the drills milled to mate with the drivers. We made such a driver and applied it to a Jacobs chuck, in such a way that it floated in the hexagon part of the chuck and could align itself with the drills. This was extremely satisfactory in use with a set of properly prepared drills. With such drills, we found that it was almost impossible for the drill to break or slip, and that it was only necessary to tighten the chuck by hand in order to hold the drill. This eliminated the need for using a wrench to secure the drill in the chuck.

Still considering the problem, I designed a hexagon with six spiral jaws and milled the jaws at about a 30-deg. angle. A special chuck was made to use these jaws and a set of drills cut to provide the same angle as the chuck. Again it was found that the drill could be tightened by hand and that it was possible to feed the drill at least twice as fast as would have been possible when using an ordinary chuck.

Another scheme we tried was to cut a 60-deg. taper on the shank of some drills, so that the smallest size of drill could be held in most any chuck. I found that end pressure on the drill held it firmly in the seat, when provided with this angle.

Personally, I have had a lot of trouble with many of the standard tapers because of the small taper usually provided by the drill maker. This caused drills to twist off frequently. Too, when we tried to turn such a taper, it was usually either too large or too small, and generally would not fit the socket. Sometimes men in the shop would resort to using setscrews in the drill press spindle to help hold the drills in place, thereby ruining the spindle.

In my opinion, shanks, as such, should be eliminated and drills should be rolled to approximately the shape required, twisted while hot to the angle desired and, again while still hot, swaged and screwed into a socket such as that shown in Fig. 3. This illustration shows a thread cut at an included angle of 30 deg., with 15 threads per in. Any socket then could be used to drive the drill.

I have come to the conclusion that all chucks should provide a positive

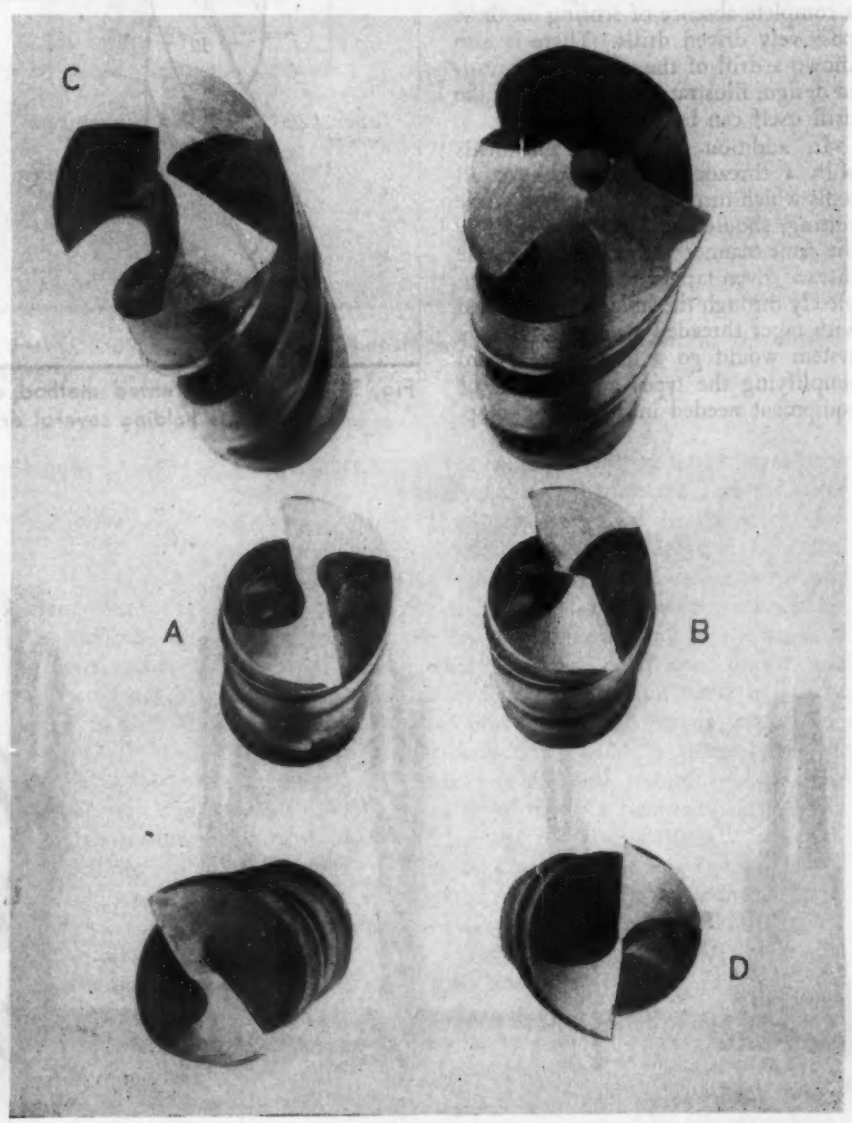


Fig. 2—Points *B* and *D* proved most successful on tough drilling jobs. *A* is typical of most 2-flute drills, and is incorrect, according to Mr. Meyer

drive and be made for all drills down to 1-in. diameter, or even less, and that all drills made from twisted stock should have a threaded 30-deg. shank. It is entirely possible that experience will show that it is possible to make drills 1/2 in. or smaller with the same threaded shanks.

There is no reason, in my opinion, why all 2-flute drills should not be made with radial cutting edges, the same as 3- and 4-flute drills are now made. It would be less difficult to thin down such drills, as compared to doing the same on drills where it is necessary to cut parallel to 25 percent of the thickness of the drill.

In support of my contention that special tapers are not required and that they are cumbersome on drills, I offer Fig. 4, which shows a reamer with a taper of about half the usual length. Fig. 4 also shows a set of straight shank drills, with a V-groove milled in each for positive driving. There is a complete absence of scoring on these positively driven drills. There is also shown a drill of the advocated threaded design, illustrating how much of the drill itself can be used.

In addition to cutting the drills with a threaded taper, I believe all tools which turn in one direction while cutting, should be threaded in exactly the same manner with exactly the same thread. Even taps, when they tap completely through the hole, could be used with taper threaded wrenches. Such a system would go a long way toward simplifying the types and amount of equipment needed in a machine shop.

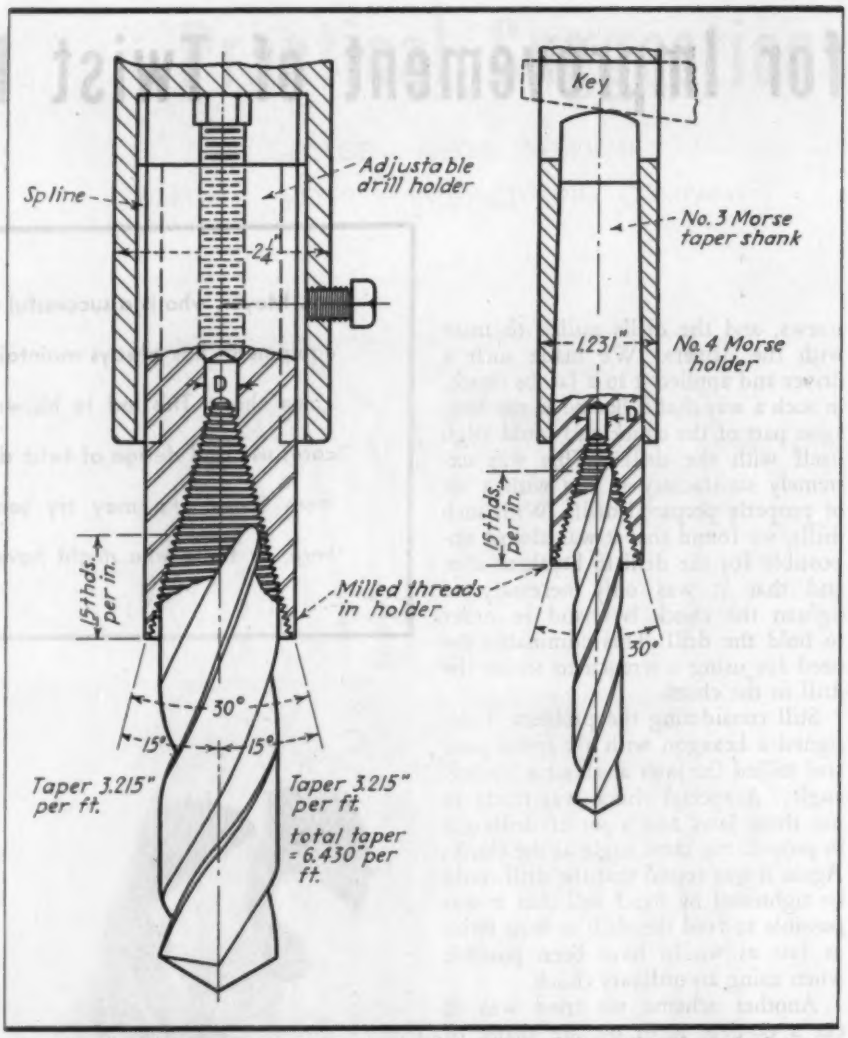


Fig. 3—A Meyer-patented method of holding drills. The threaded taper permits holding several drill sizes in the same holder

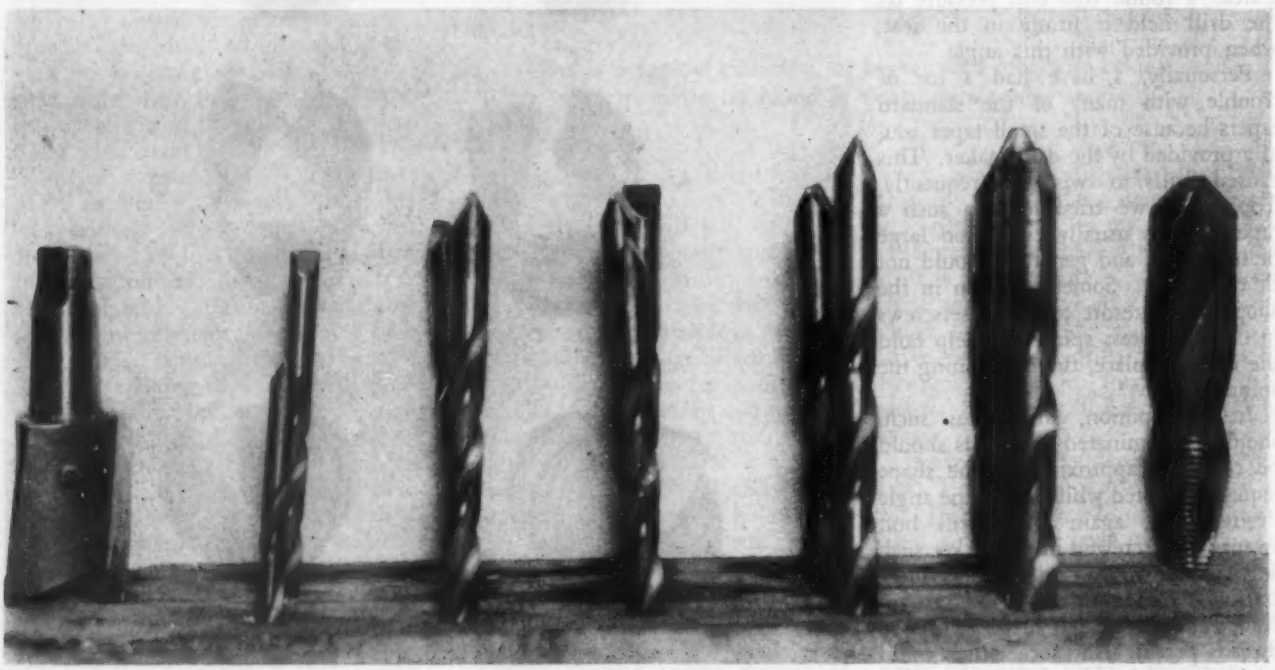
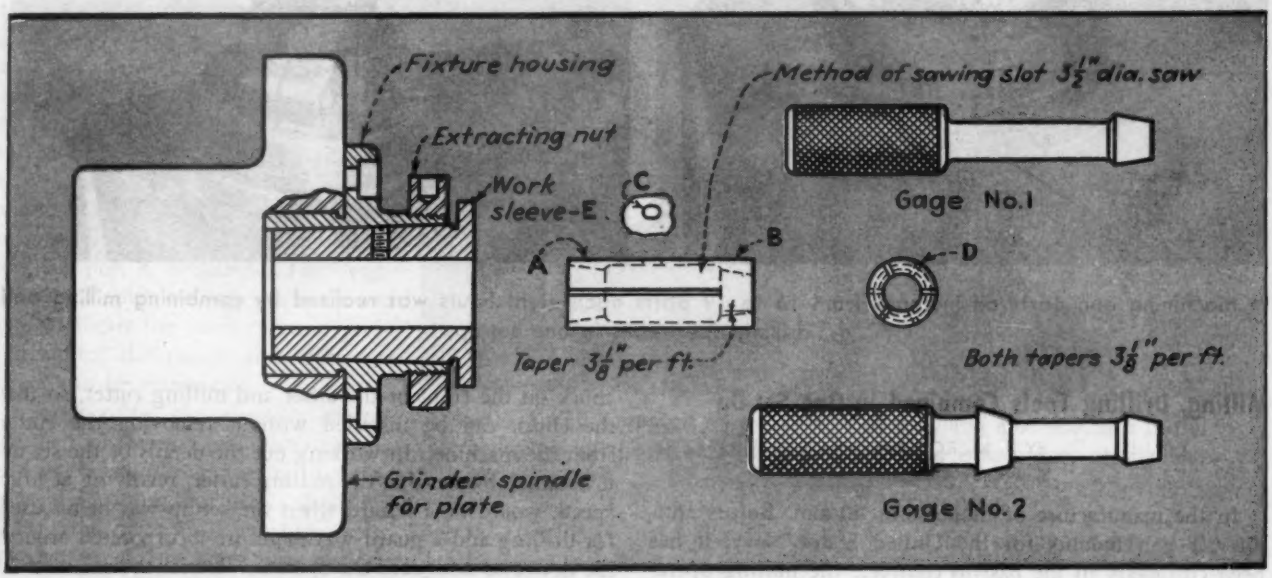


Fig. 4—The use of the proposed threaded taper, or shorter standard tapers, permits more of the drill to be used, with less waste material

Practical Ideas

War-Winning Suggestions appearing on these pages were selected from those recognized as meritorious by the Board for Individual Awards, War Production Drive. They are freely offered to industry as an aid to war production



A method whereby expansion arbor sleeves may be ground with almost perfect accuracy down to an outside diameter of 0.750 in., both tapers being ground from one end by means of special tools

Fixture for Grinding Small Tapered Sleeves

BY J. H. KAUTSKY
Dodge Plant, Link-Belt Company

The use of expansion arbor sleeves, ranging from 1½ in. o.d. to 7 in. o.d., on radius grinders mounted on spindle noses, with drawbars attached, has been standard practice at this plant for several years, but when we were called upon to make up some of these sleeves in sizes as small as 0.750 in. o.d., we ran into difficulties.

As shown in the accompanying diagram, a 0.750-in. o.d., sleeve has a very small bore and tapers at each end which are very sharp. The bores of these tapers cannot be ground in the conventional manner at one setting, both tapers being ground from the same end. The smallest wheel and spindle made could not reach the back taper because the work would be at too great an angle to allow the spindle to reach the back taper at *B*. The bores and outside diameters of the parts these sleeves produce must be within 0.0005 in. of being concentric and this accuracy could not be obtained by reaming the tapers of the bore, hardening and grinding on an arbor. It was therefore decided to make up the two gages shown in the diagram.

These gages were made of a good grade of oil hardening tool steel and the machining operations started with a roughing down of bar stock to within 0.015 in. of the finish size. The undercut was then bored and the piece cut off. A bore plug gage was used in the bore. Six equally spaced slots were cut into the sleeve at *D* with a 1 1/16 in. slotting saw, but were not cut all the way through. The slots were burred and sleeves were drilled and slotted for the drawbar knockoff pin, as shown at *C* and the sleeves were then hardened and drawn and ground on the outside diameter to within 0.005 in. of the finish size tolerance, plus 0.0000 in. minus 0.0001 in., this tolerance being necessary in order to insure a snug fit into the sleeve of the bore grinding fixture.

For the bore grinding of tapers a sleeve was inserted in the work sleeve, *E* of the grinding fixture, with *A* inserted first, with *B* nearest the grinding wheel, to be ground first, with 0.006 in. to be removed from the bore. At completion of grinding of the *B* ends of all the sleeves, the *A* ends were ground. The slots in the ends of the sleeves at *D* were then ground through.

These sleeves are used on spindle noses attached to the work spindles of grinders and in the last year have produced thousands of accurate and satisfactory small parts in sizes down to 0.750 in. The fixtures used in grinding these sleeves can also be used to grind true bores in other bushings and sleeves made in toolrooms that require concentricity and which have straight or tapered bores.

In machining gun parts an increase from 16 to 19 parts each eight hours was realized by combining milling and drilling operations in one set-up

Milling, Drilling Tools Combined in One Set-Up

BY J. M. ROBERTS
Blaw-Knox Company

In the manufacture of mounts for 40-mm. Bofors anti-aircraft gun mounts for the United States Navy, it has been customary in the past to complete the milling operation and then remove the cutter from the machine, replacing it with a holder for a quick-change chuck for drilling.

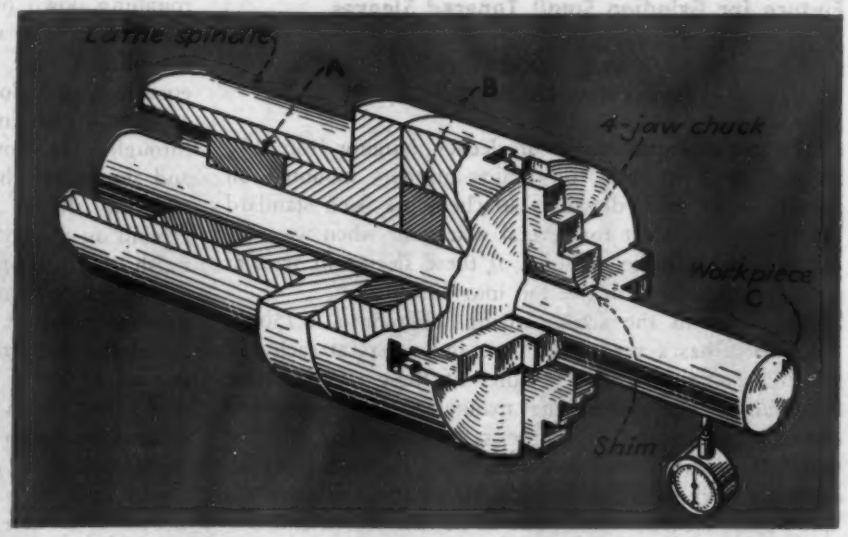
These parts are now milled and drilled with one set-up on horizontal boring mills by fitting the quick-change chuck on the front of the arbor and milling cutter, so that the chuck can be installed without removing the cutter from the machine. In working out the details of the set-up it became obvious that the milling cutter, revolving at high speed, would be a hazard when the set-up was being used for drilling and a guard was therefore incorporated around the device to safeguard the operator. Under the old method the production rate was 16 pieces each 8 hr., while through the use of the new method it is now 19 pieces. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*

Long Stock Lathe Set-Up Which Eliminates a Steadyrest

BY WALTER JAKES

There are a number of ways to set up long cylindrical pieces in the lathe for the performance of a second operation. Usually it involves the use of a steadyrest, which makes the set-up awkward and gives rise to chatter and marred surfaces at high speeds. The use of a steadyrest can be eliminated by the following method:

Where a piece of mild steel, or brass, is being press-fitted either into the bore of the lathe spindle, *A*, or into the back of the four-jaw chuck, *B*, or both and is being drilled and bored to hold one end of the work piece, a slip fit, the other end of the work piece, *C*, can be held by the jaws of the four jaw chuck and can be indicated to any required degree of accuracy.



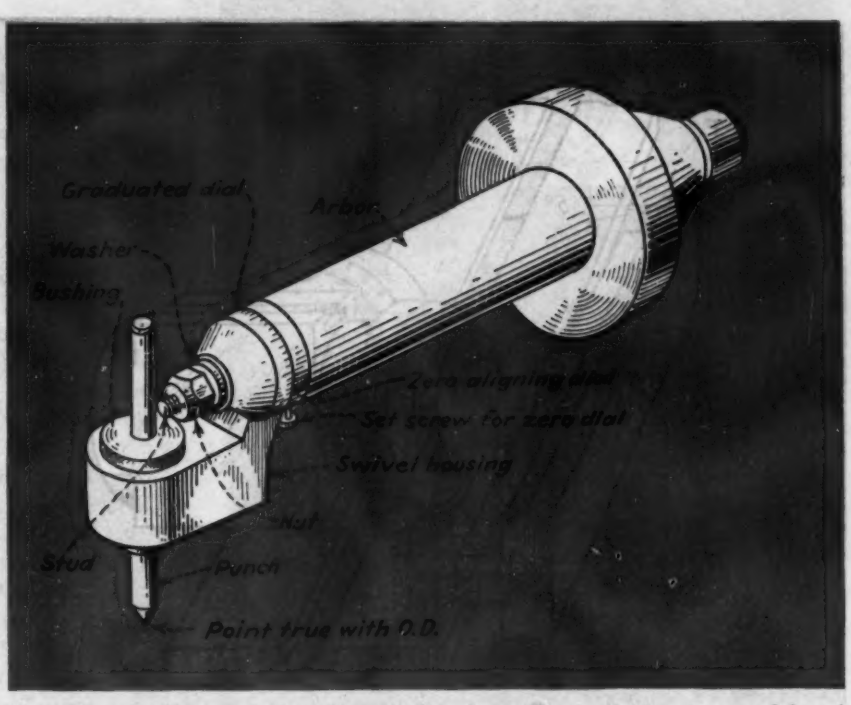
With the set-up shown, a lathe can be run at any speed—and all new surfaces being machined will be both concentric and square to the original surfaces

The machining of the piece can be performed much more easily without the use of a steadyrest and with the additional advantage of running the machine at any desired speed for best efficiency. All new surfaces being turned or bored will be both concentric and square to the original surfaces of the work piece.

Lay-Off Punch Holder Used As a Layout Tool

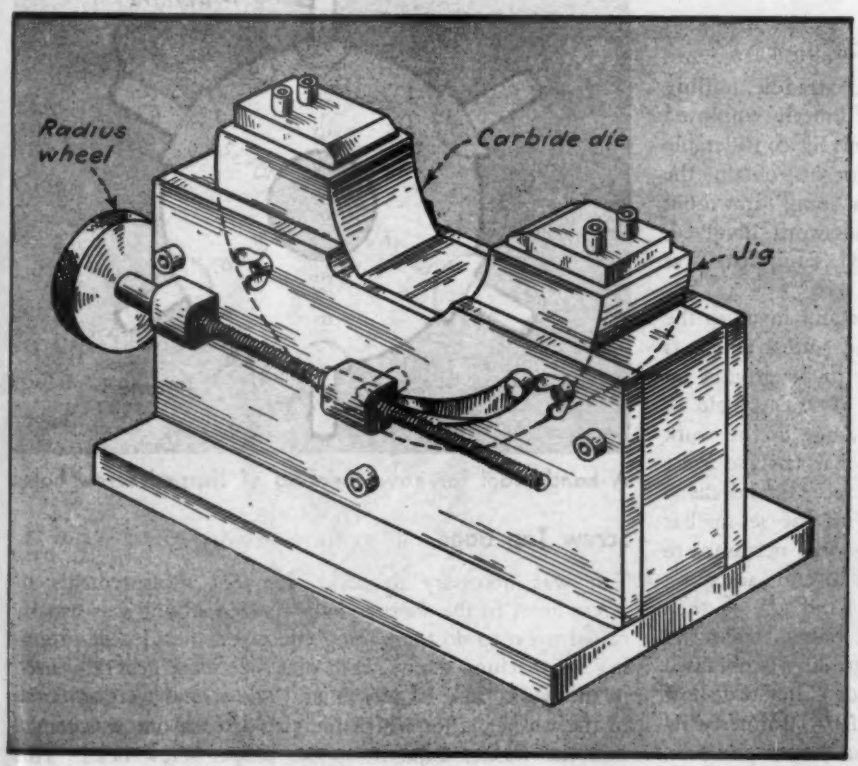
BY PFC. CHARLES M. CLARK
Mt. Home, Idaho

This tool was designed to lay off work pieces with more speed and accuracy than could be obtained by means of the present method employing a scale, dividers, hand punch and other accessories. The tool is particularly useful in the case of work pieces that have one or more sides to be machined in accurate relation to each other and pieces that have a shape that makes the hand method difficult because of odd design, bosses, or shoulders, which may make measurements and location a problem. The lead-screws of the milling machine are used to locate the work piece in position under the punch and close accuracy can be maintained.



A center punch, mounted on the spindle of a milling machine, is a useful tool for laying out parts of odd shapes, or those with bosses or shoulders

Reference to the diagram shows that the tool amounts to a center punch, held in the spindle of the milling machine in a manner that allows clamping of the work piece to the machine table. Then by use of the lead-screws of the knee, saddle and table the piece can be moved to the correct position under the punch and the layout made. The head of the tool swivels and three sides of a part can be laid out at one setting, as can parts that have angles or slopes in their design. By the use of simple trigonometry and shop mathematics almost any type of work can be laid off.

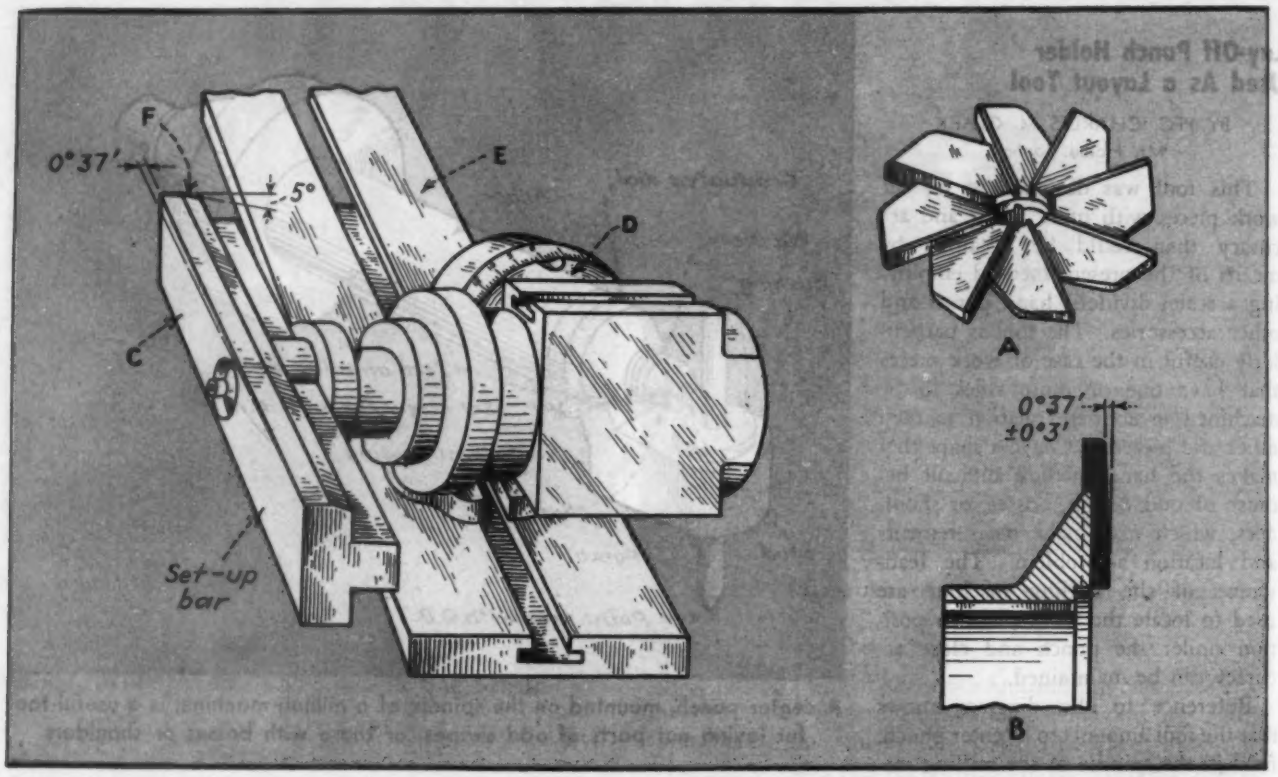


A radius grinding fixture in which carbide dies are set in one position only, eliminating two-direction grinding and the imperfections caused by that method

One-Position Radius Grinding Fixture

BY WALTER NADOLNY
Radio Corporation of America

In grinding cemented-carbide dies the radius was arrived at by moving the grinding machine in two different directions, but that method of doing the job caused many imperfections. As a result it was necessary to do considerable lapping of the carbide dies with diamond dust, on a special diamond wheel, to correct the imperfections. In order to avoid the necessity for lapping, a radius fixture was made and dies were set in this fixture in one position. The radius can be swung in an arc by means of a wheel on the fixture. By this means the lapping process, which was slow and tedious work, has been eliminated effecting a considerable saving in material and also saving about 700 man-hours per year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



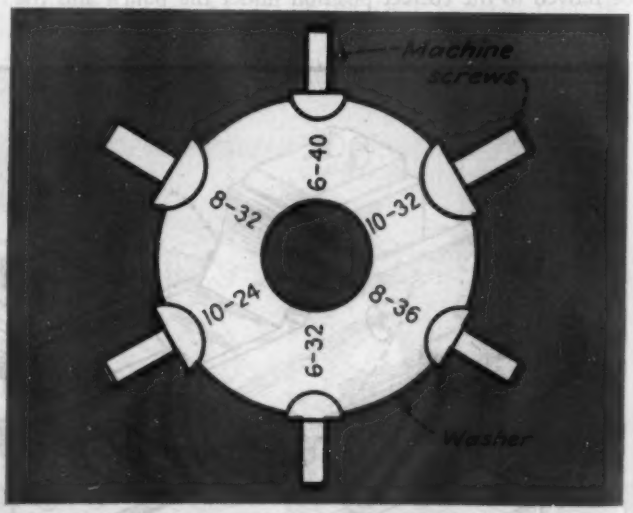
Elimination of guesswork and delay in locating milling cutters for resharpening by means of a special set-up bar reduced the time from 10½ to 2½ hr. per pair

Set-Up Bar Assures Accuracy in Regrinding Milling Cutters

BY D. L. WRUBELL, Packard Motor Car Company

When resharpening of carbide-tipped straddle milling cutters became necessary, the method formerly employed for locating the blades accurately involved considerable preliminary trial work in an endeavor to obtain the correct angle and it was frequently a long, drawn-out process. In order to eliminate the guesswork involved, with consequent loss of time, a special set-up bar was developed.

The work is done on a cutter grinder and involves the resharpening of the eight blades of the cutter, which is shown at *A*, while *B* shows the angle to be ground on each blade. The set-up bar is shown at *C*, and is held in place by the washer and screw on the arbor in the work head of the unit, as shown at *D*. This bar has the exact 0.0 deg. 37 min. angle ground on the face, *C* and the 5 deg. clearance angle on the top, *F*. With the set-up bar attached and head *D* set on 5 deg., it is only necessary to indicate the top of the bar *F* from end to end, adjusting until parallel with the table *E*. The hand, *D*, is then locked in that position. Indicating the face *C* from end to end the table is adjusted until a zero reading is obtained at each end and is then locked. A pair of cutters can now be resharpened in 2½ hr., as against 10½, formerly required, saving approximately 2,100 man hours per year. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



A handy tool for easy checking of tapped screw holes

Screw Tap Gage BY RONALD EYRICH

It was necessary to make frequent measurements of screw holes in the shop and the machinist who was usually called upon to do the gaging conceived the idea of grouping six machine screws, each of a size most generally used in the work, on a large washer. The screws were soldered to the washer, after which the size of each one was etched into the washer adjacent to the proper screw head. This ingenious and inexpensive gage has simplified and speeded up the gaging of screw holes in the work of the shop.

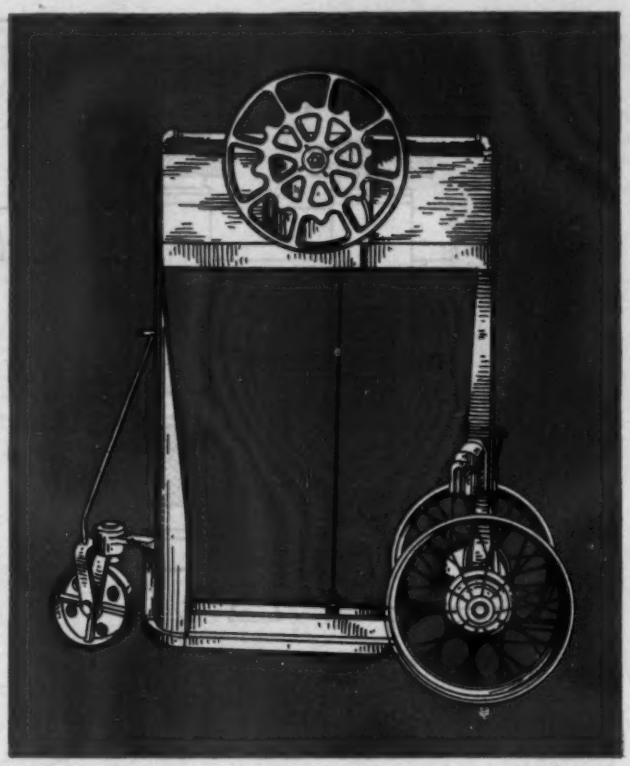
Freight Car Doors Hung by a Lift Truck

BY. L. W. SAGLE

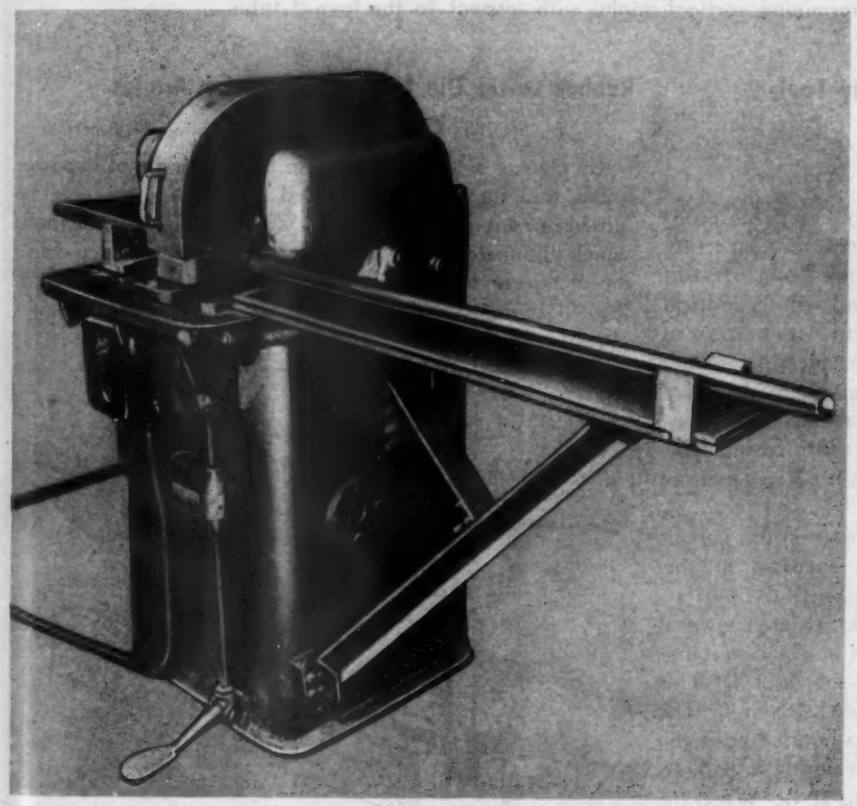
When changing doors on freight cars it has been customary in the past to use an automatic shop crane, whenever one was obtainable, but as these cranes are usually kept busy in the shop it was not always possible to obtain the use of one for yard work. When a door is ready to be hung and no crane is available a costly delay occurs, or, about six men with strong backs have to be taken from other work to do the job. To eliminate these delays, or the necessity for such heavy lifting by the men, a car man at the Chillicothe, B. & O. Railroad, car yard conceived a device to do the job quickly and efficiently.

The device consists of two old automobile wire wheels, one switch wheel from an old standard shop truck and a body frame of pipe, with angle iron bars. The lifting arrangement consists of a brake wheel and ratchet from an old freight car, with 3/8 in. steel cable for raising the car door, with bottom track in place to position the door on the side of the car. One car man and a helper perform the operation satisfactorily, conserving many man hours.

The device is wheeled to the place where the car doors are stored and a door placed on the rack. When alongside the car to be fitted the door is raised about 18 in. and the bottom track is inserted in the rollers. Both door and rack are then easily and quickly run up into position and the door hung on the car. It is to be adopted as approved standard practice at all B. & O. car yards.



An easily constructed portable lift truck by which two men transport and hang freight car doors in a portion of the time formerly required to do the job manually



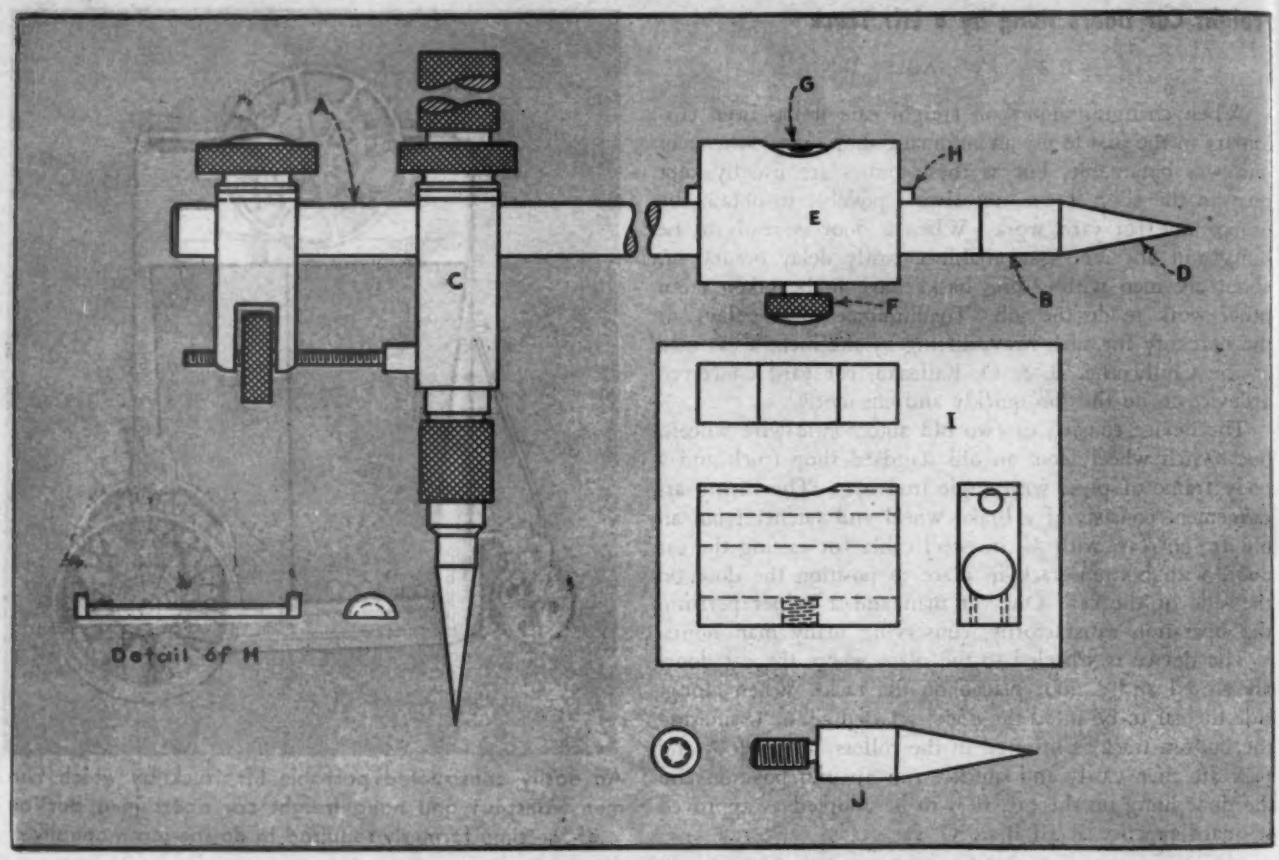
Breakage of abrasive cutting wheels through movement of the stock has been eliminated by the addition of supporting extensions, which also enable the operator to make precision cuts

Stock Supports on Abrasive Cutoff Machines

BY W. P. MORGAN
Curtiss-Wright Corporation, St. Louis, Mo.

In cutting up long pieces of stock it frequently happened that abrasive cutting wheels were broken as the result of even a slight movement on the part of a helper holding the end of the stock. In order to eliminate this breakage and waste, both of material and time, shelf extensions of two types for supporting long pieces of stock were devised and have been added to abrasive cutting-off machines.

The extension on the smaller of the two units, as shown in the illustration, has a steel plate extension 3 ft. long, on which a V-block can be clamped at any desired point, offering firm steady support to the stock being cut. The second, or larger, cutoff unit, has a long extension equipped with rollers. These two types of stock supports enable the operator to cut to a close tolerance and each piece can be cut to any exact length. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



A handy tool for determining vertical angles with respect to the layout table

Reconverted Trammel Proves a Handy Tool for Inspection and Layout Work

BY LEO REDFIELD

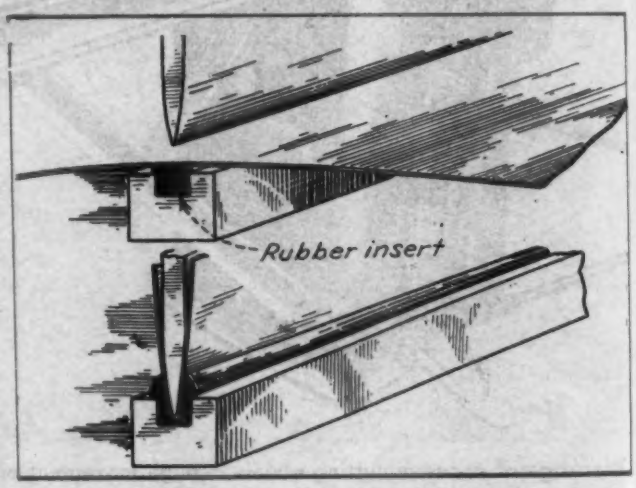
A conventional beam trammel, which has been reconverted to other uses, makes a handy tool for inspecting finished work, or for laying out the center point of radii from the inside surfaces of cylindrical and semi-cylindrical units when they are in a vertical position with respect to the layout table, thereby eliminating a considerable amount of layout work and associated calculations in reaching answers to such problems when ordinary methods of determining true centers at right angles to the machine table are involved. The details of the reconverted trammel are shown in the illustration.

This handy reconverted device, with one of the pointer legs removed, is indicated by *A*. At one end of this trammel a hole has been drilled and tapped at *B*, to accommodate the point *D*, the details of which are shown at *J*. The vertical trammel point is shown at *C*. A rectangular block is slipped onto the beam, as shown at *E*. This block is formed as shown in the detailed sketch *I*. The block is held in place by the screw with a knurled head and the block is kept from turning on the beam by the gib, *H*. A level is fitted onto this block as shown at *G*. When the level is in a leveled and balanced position, the horizontal and vertical points of the trammel will form an angle of exactly 90 deg.

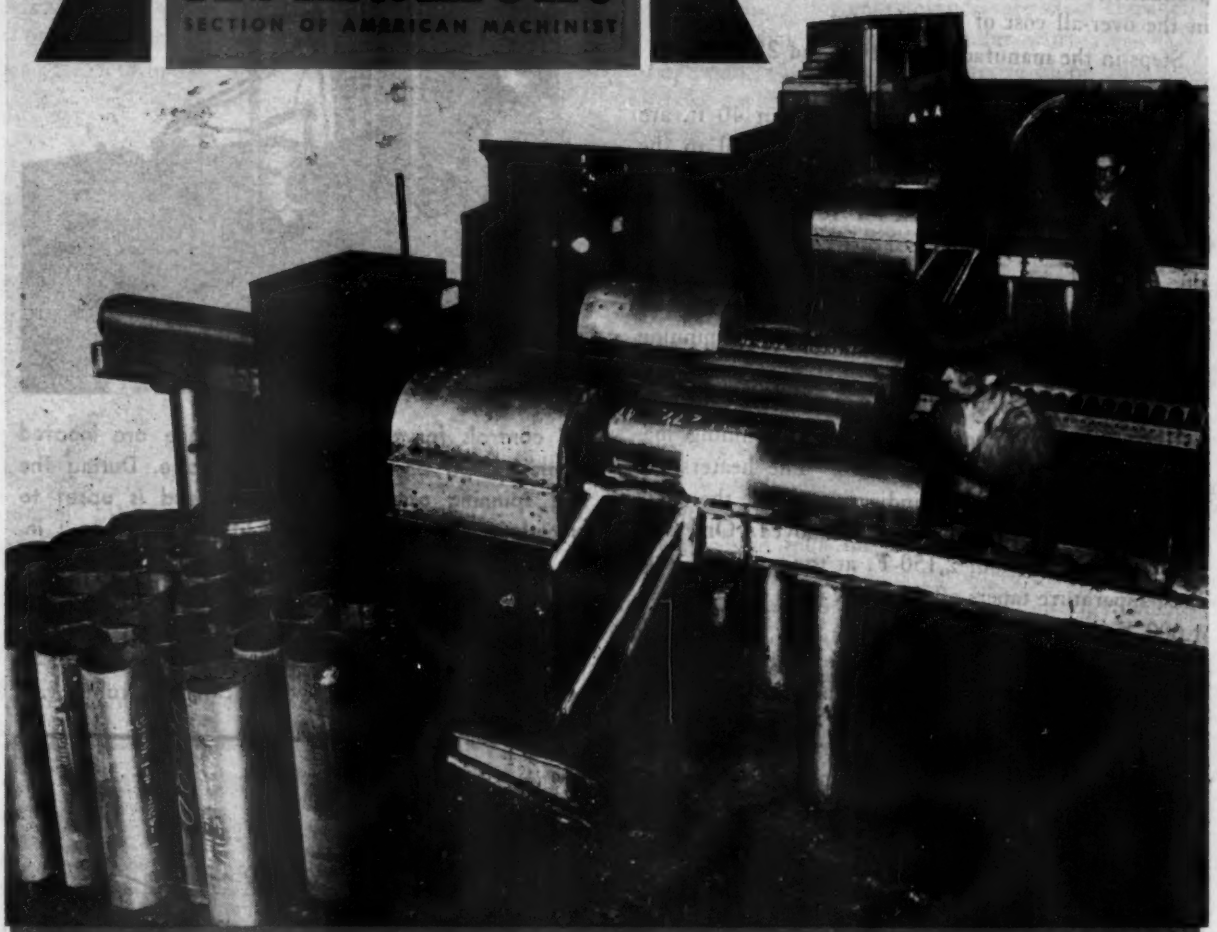
Rubber Lower Die for Forming Sharp Angles

BY VALENTINE KARABA, Murray Corporation of America

By placing a rubber blanket in the lower die of a power brake, thin metal such as is used for airplane skin can be closed to any desired angle. When using this method, which eliminates at least one operation, chances of cracking the metal are reduced, and a good, clean angle is formed. *War Winning Suggestion from the Board for Individual Awards, War Production Drive.*



Use of a rubber insert in the bottom die of a power brake permits the forming of sharp angles in thin metal sheets



Electric induction heaters are used to bring one end of the bomb tube to a temperature of 2,150 F. for the nose spinning operation. Tube lengths are handled on spool-type roller conveyors

Seamless Tubes and Spinning Process Result in Superior Bomb Casings

DESTRUCTIVE BOMBS, a highly effective weapon in modern warfare, are being produced by the metal-working industry in astronomical quantities. The National Tube Company is credited with a major contribution in bomb production by introducing seamless tube bomb bodies with required contours formed by spinning. All types of bombs ranging in size from 100 to 1,000 lb. have been produced by the spinning process.

Before the war the company's engineers worked with Army Ordnance engineers in making experimental bombs which were tested under various conditions. Most of the experimental bombs were forged by piercing solid billets and drawn on benches, or were made by cupping and drawing plate sections similar to processes used in making high-pressure gas cylinders.

Further experiments, however, indicated that seamless tubes were ideal for forming contours required on bomb bodies. The bombs were made at first by hammering the nose and tail section on the tube, but the process gave way to spinning, an operation long used by the company in manufacturing cylinders. Special bomb spinners were designed and installed, and more than 40 machines are in operation today.

The spinning operation results in a superior bomb at a high production rate with virtually no loss in

metal. The nation's extensive seamless tube facilities are utilized for producing bomb bodies. The new production methods effected a substantial reduction in the over-all cost of manufacture.

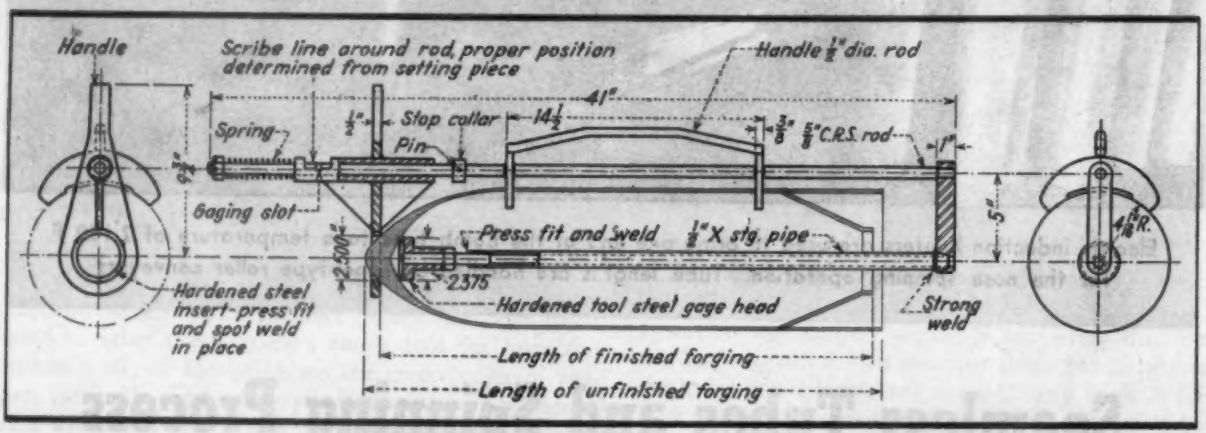
Steps in the manufacture of 100- and 250-lb. seamless tube bomb casings follow:

Mill lengths of tubing averaging about 40 ft. are delivered by freight cars from the tube mill to the bomb shop. The tubes are cut to lengths required for single bomb bodies: 31⅝ in. for 100-lb. bombs, and 38⅛ in. for 250-lb. bombs. Each bomb body has its side stenciled with the heat number of the tube from which it was cut. Roller conveyors carry the cut-off tube lengths to heaters adjacent to each nose-spinning machine. High-frequency electric induction heaters are used for heating tube ends prior to spinning.

Three induction heaters serve each spinning machine nosing 100-lb. bomb bodies. The heaters are automatic, a signal light indicating when the cycle is completed and the tube can be removed. One tube end is heated to about 2,150 F. at the open end, and the temperature tapers off from the open end to about 1,600 F. at a point 10 in. away.

The tubes are then taken by roller conveyor to the spinning machine where the cold body is gripped in a large collet chuck in the machine spindle. The chuck is closed centrifugally as the spindle starts to rotate. The tube rotates at about 3,000 surface ft. per min. A roller on a hydraulically controlled car-

All controls for the spinning machine are located in this pulpit beside the roll carriage. During the first spinning operation the nose end is upset to provide a nose thickness of a little more than 1 in.



Fabricated from flame-cut steel plate, rod, pipe and hardened tool steel gage pieces, this inspection gage is used for checking nose thickness on 100-lb. bomb body forgings

An inspector on the conveyor line leading from each nose spinning machine checks contour of the spun bomb nose with a templet gage

riage advances to form, close and upset the nose end. During this operation, oxyacetylene torches maintain the temperature of the heated section.

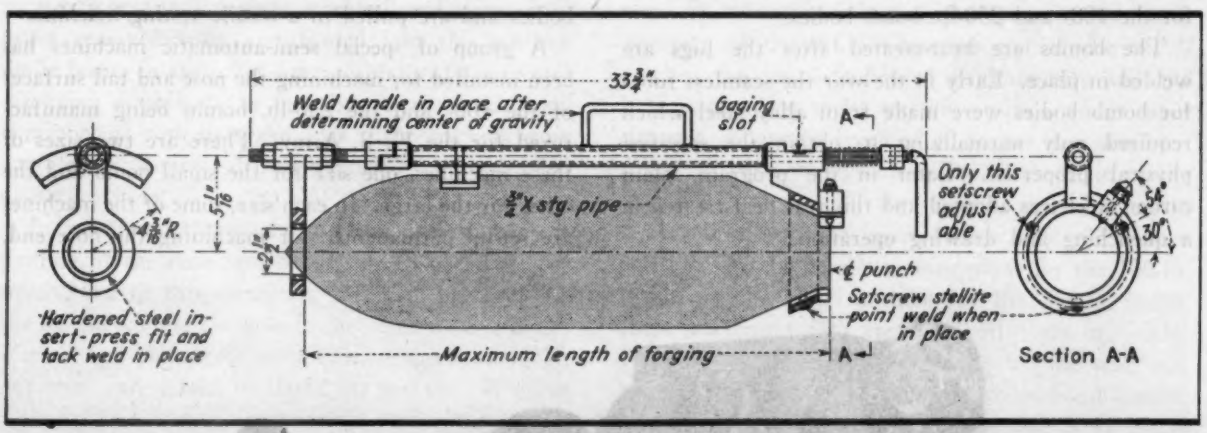
The 100-lb. demolition bomb used by the U. S. Army has a single radius on the nose and the tool head is advanced axially while being swung through an arc approximating 60 deg. The 250-lb. bomb is formed on the nose end in a similar machine of larger capacity, but the roller head is cam-controlled to form the double radius required. The spinning process has progressed to a point where each machine crew can nose one 100-lb. tube each minute. Because of its larger diameter, the 250-lb. bomb bodies are turned out at a rate of 42 per hour per machine.

Spool-type roller conveyor lines carry the nosed bodies from the spinning machine to an inspection station. While enroute, the hot nose tip is struck a sharp blow with a hammer to provide a flat surface for starting a drill in subsequent machining operations. The bodies are then transferred to rails where they are checked while rolling sideways. An inspector uses three simple gages in checking the contour of the spun nose, the nose thickness, and the over-all body length. Allowed tolerances are close considering commercial practice for similar work.

After inspection, the bodies move along rail supports to gas-fired furnaces where the tail end of each tube is heated to about 2,000 F. for a length of 8 to 10 in. in preparation for the tail spinning operation. Tail spinning is performed on a machine identical to that used for nose spinning. Two sizes of machine are necessary for the two sizes of bomb bodies. A contoured roller is used in this operation, and oxyacetylene torches are again used to maintain temperature of the rotating tube throughout the spinning operation. Production rates for the tail spinning operation on the 100- and 250-lb. bomb bodies are about the same as for the nose spinning operations.

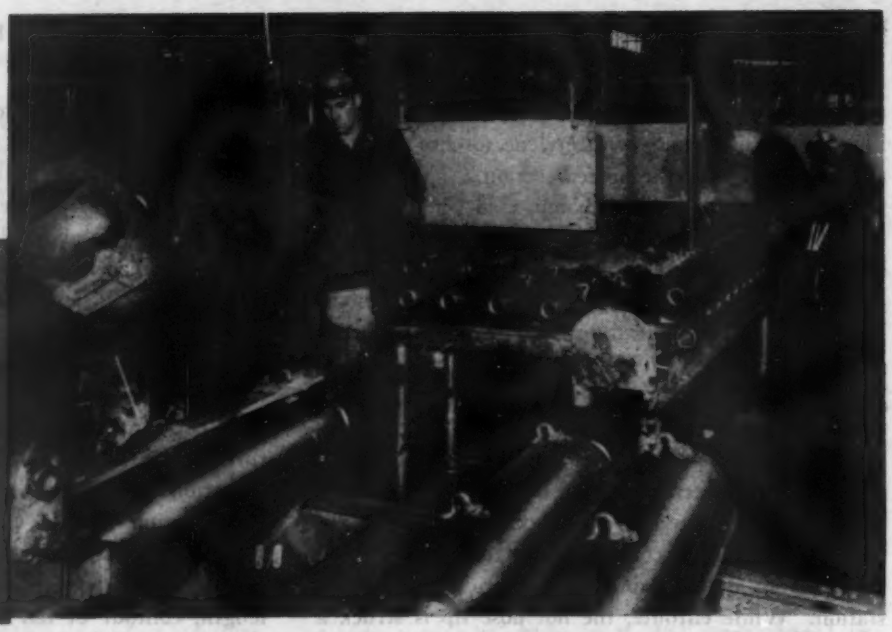
Each bomb body is then reinspected for over-all length, contour of tail section, and length of cylindrical section spun on the tail end. A variation of plus or minus 1/16 in. is permitted on the contour of either the nose or the tail end, and on the diameter of the reduced section at the tail end.

The bomb bodies then go to welding booths for the attachment of suspension lugs. First, two lugs



Length of finished forging is checked with this gage. Tail contour is checked with a templet and a snap gage is used to test the tail end diameter

Tail section on each bomb body is spun with a contoured roll in machines similar to those used for spinning nose ends. Contours are held close



Three suspension lugs are arc welded to each bomb body in this welding booth. These lugs are located in position for tack welding by the simple fixture shown at the left

are located on one side of the body by a fixture and tack welded into position. Following this, a single lug is located in the center of the opposite side of the bomb and tack welded. The bodies are then rolled to a conveyor line where the lugs are finish arc welded onto the bombs. Separate lines are maintained for the 100- and 250-lb. bomb bodies.

The bombs are heat-treated after the lugs are welded in place. Early in the war the seamless tubes for bomb bodies were made from alloy steel which required only normalizing to obtain the specified physical properties. Later in the program, plain carbon steel was adopted and this was heat-treated in a quenching and drawing operation.

After heat-treatment, the bombs are carried on a conveyor to the machining group where the nose and tail surfaces are finished. At this point three bomb bodies from each heat lot are selected for physical tests in the nearby laboratory. Here the strip specimens, taken 180 deg. apart, are cut from each of the test bodies and are pulled in a tensile testing machine.

A group of special semi-automatic machines has been installed for machining the nose and tail surfaces of the 100- and the 250-lb. bombs being manufactured for the U. S. Army. There are two sizes of these machines, one size for the small bomb and the other for the large. In each size, some of the machines are set-up permanently for machining the nose end,

This four-spindle horizontal machine is arranged only for machining operations on the nose end of the 100-lb. demolition bomb. A slightly larger machine of the same design is used for the 250-lb. bomb

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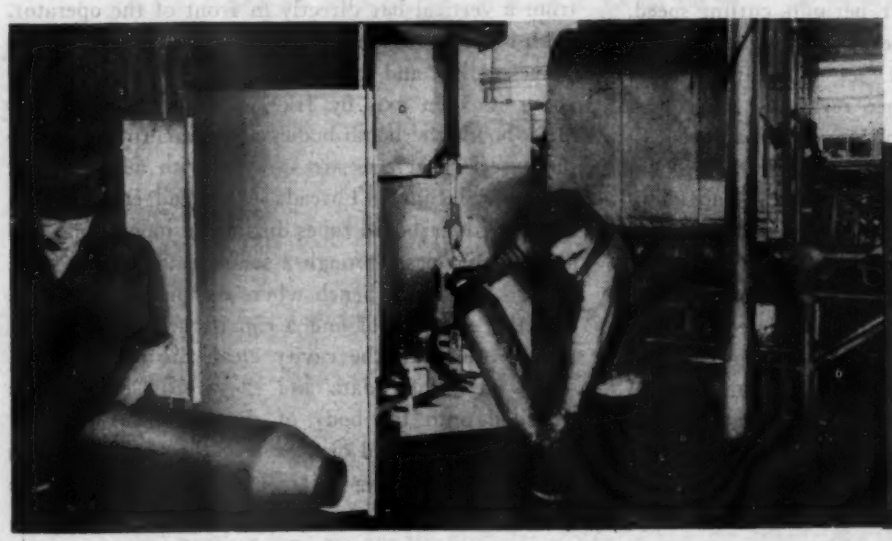
Fluorescent lights are used over this inspection bench where each bomb body is carefully checked by shop and Ordnance Department inspectors

while others are arranged for operations on the tail end. Each is a four-spindle horizontal unit with a five-station trunnion-type fixture.

First, rough bomb bodies are delivered to the machines tooled for operations on the nose end. The body is rolled directly from the conveyor line into the fixture, where it is gripped in chisel-steel jaws, work being removed from and loaded into this position while bodies in the other four positions of the fixture are being machined. In this fixture, the bomb body is gripped at both ends, the jaws at the tail end being operated by a motor-driven wrench fixed to the bed of the machine.

In machining the bombs the first operation is the drilling of the nose at a cutting speed of 55 ft. per min. Feed at this spindle is 0.018 in. per rev. At the second spindle the hole in the bomb nose is rough reamed and chamfered at a cutting speed of 40 ft. per min. and a feed of 0.032 in. per rev. A finish reaming and facing operation is performed at the third spindle. Here, the cutting speed is 45 ft. per min. and the feed again is 0.32 in. per rev. Final operations on the nose is performed by the fourth spindle, at the top of the machine, which carries a 2.375 in.-12NF-1 tap. The tapping head has an independent drive, and the entire head is fed forward by a leadscrew during the operation to insure accuracy of threads. When the end of the cut is reached the tap is collapsed automatically and the head is returned to its starting position under rapid traverse. A tapping speed of 30 ft. per min. has been found to be most suitable. The entire cycle of the machine is automatic, the operator only having to load and unload the bomb bodies from the fixture position. As the nose hole dimensions for the 100-lb. bomb are the same as those for the 250-lb. bomb, these machining data apply to both sizes of bombs. Production per hour per machine for the nose machining operations is 60 of the 100-lb. bomb bodies. Hourly production for the 250-lb. size is 42 pieces



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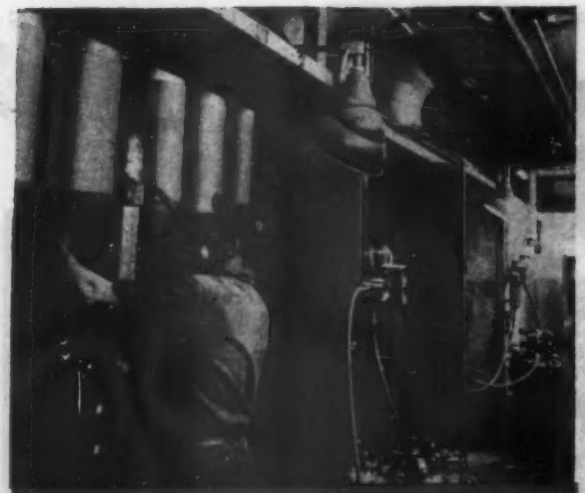
Automatic-cycle shot-blast machines clean bomb bodies inside and out. Separate machines are used for the 100-lb. and the 250-lb. bombs



Bomb bodies are painted inside and out in two spray booths. They are then carried by the same conveyor through a steamheated drying oven

because of the larger size of the piece.

In the 100-lb. and 250-lb. lines, finished pieces are moved on roller conveyors from the nose finishing machines to the machines used for tail-end operations. These four-spindle units are of similar design to those employed for nose-machining. The operator loads the work in the horizontal trunnion-type fixture directly from the conveyor line, as before, except that in this set-up the tail end of the bomb is placed in the forward position. Sequence of operations is as follows: For the 100-lb. bomb, (1) face end with eight-tool facing head, 60 ft. per min. cutting speed and a feed of 0.080 in. per rev.; (2) rough bore with six-tool boring head, cutting speed 60 ft. per min. with a feed of 0.080 in. per rev.; (3) ream and chamfer with two-tool boring bar, 60 ft. per min. cutting speed with a feed of 0.080 in. per rev.; (4) tap thread with collapsible 3.625 in.-12NF-1 tap at 60 r.p.m.; for the 250-lb bomb, (1) face end with eight-tool facing head at 40 ft. per min. cutting speed, with a feed of 0.032 in. per rev.; (2) rough bore with eight-tool boring head, 40 ft. per min. cutting speed with a feed of 0.032 in. per rev.; (3) ream and chamfer with two-tool boring bar, cutting speed 40 ft. per min. with a feed of 0.032 in. per rev.; (4) tap thread wtih collapsible 5.500 in.-12NF-1 tap at 30 r.p.m. Production rate for the tail-end machining operations is likewise 60 per hour for the 100-lb. bomb and 42 per hour for the 250-lb. bomb.

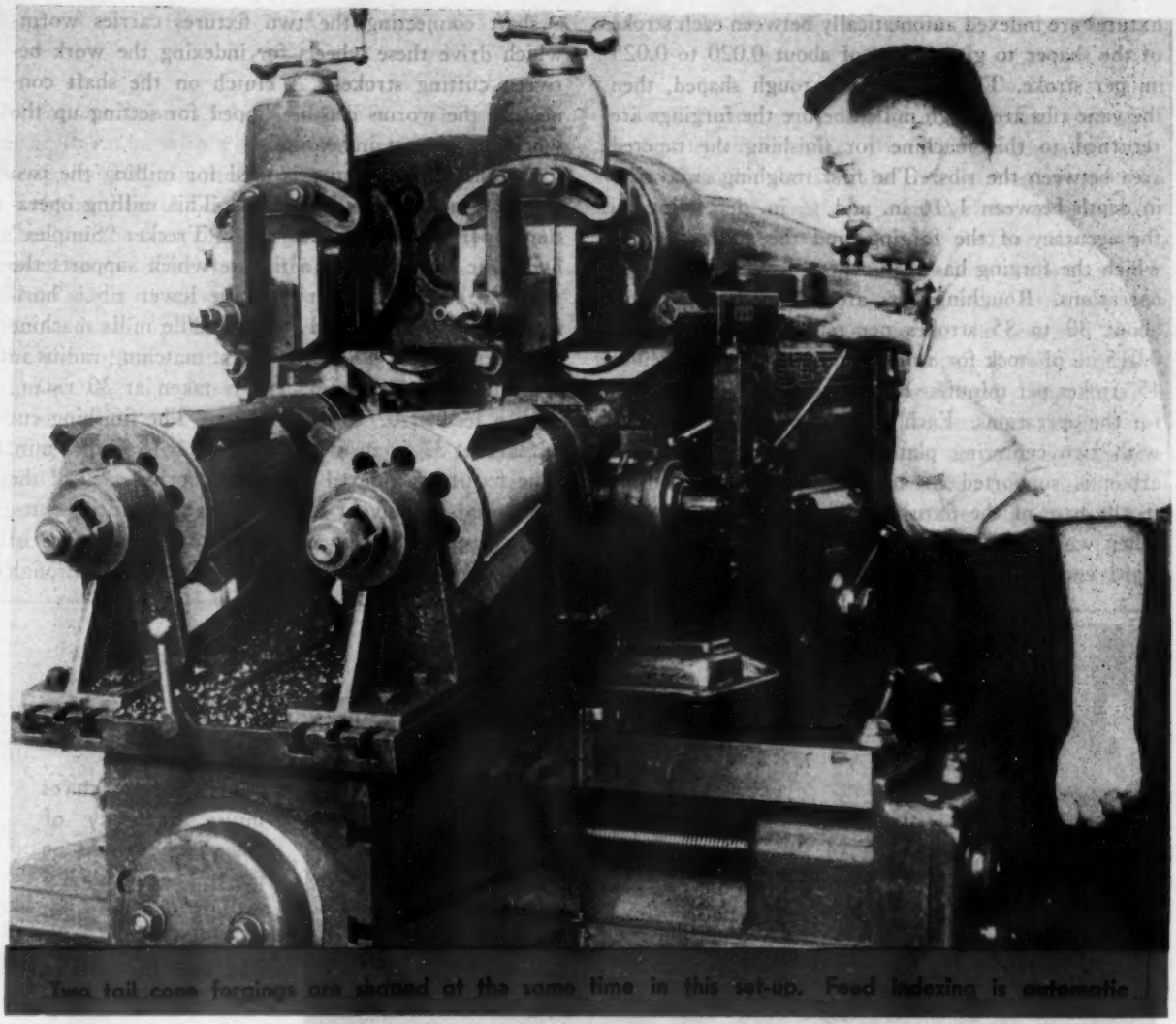
As machining operations are completed, 100-lb. and 250-lb. bomb bodies are delivered by roller conveyor to an inspection bench where a group of shop inspectors carefully check each dimension on each bomb body. Before the bodies are removed from this bench a group of Ordnance Department materiel inspectors check the same dimensions. Hand taps are used at this bench to correct tight threads in the nose, and a special piloted counterbore cutter is available to correct nose faces that are too small in diameter. Then the bodies roll further along these support rails to a device in which the welded lugs are tested by dropping weights hooked to them. A 1,000-lb. weight is used to test the lugs on a 100-lb. bomb body, while a 2,500-lb. weight checks the welding of lugs on a 250-lb. bomb body.

After lug testing, the bombs are degreased and allowed to dry before being suspended to an automatic-cycle shotblast machine which cleans all interior and exterior surfaces, except those that have been threaded. Each of the machines used for this operation has two stations, one outside for loading and unloading the work, and the other inside the machine where the work is rotated while nozzles which clean the interior and exterior surfaces rise vertically from the lower to the upper extremity and return. For this operation a hook is screwed into the threads at the nose end of the bomb body, and a large rubber band is placed around the threads at the tail end to protect them from damage. These machines are timed to clean about 60 of the 100-lb. bodies or 50 of the 250-lb. bodies per hour.

From the shotblast machines, bomb bodies are delivered by conveyor lines to a final inspection unit where all necessary dimensions are checked and any defects which can be remedied are repaired. Ordnance Department materiel inspectors follow the shop inspectors down a line of bomb bodies. While on the inspection benches the bomb bodies are stenciled with the identifying information, including the bomb style and lot numbers, the initals of the manufacturer, and the year in which it was made.

Casing Interiors Painted

The bomb bodies then are delivered to a conveyorized paint spray line. Here the interior of each bomb is coated with a black anti-acid shell paint by a long-tube spray gun mounted on a carrier supported from a vertical bar directly in front of the operator. Each bomb is suspended from a swivel carrier on the conveyor line, and while in the spray booth is rotated about its own axis by friction drive. At the next spray booth the bomb bodies are again rotated while the exterior surfaces are sprayed with a single coat of yellow lacquer. Threads at the tail end are protected with carboard tubes during this operation. The bomb bodies pass through a steamheated drying oven and go to a work bench where an end plug is fitted into the nose thread and a cap is threaded onto the tail end to keep the cavity clean during shipment. Then identifying data and the word "empty" are stenciled onto the body of the bomb. A piece of wood is steel-banded over each of the support lugs to protect them during shipment. The finished bomb bodies are taken to designated Army loading depots.



Two tail cone forgings are shaped at the same time in this set-up. Feed indexing is automatic

Unusual Fixtures Employed In Making Torpedo Tail Cones

BY CARL G. PREIS, Vice President and General Manager, Amertorp Corporation, Division of American Can Company

Naval units made from heavy steel forgings are subjected to careful inspection checks during machining and assembly operations

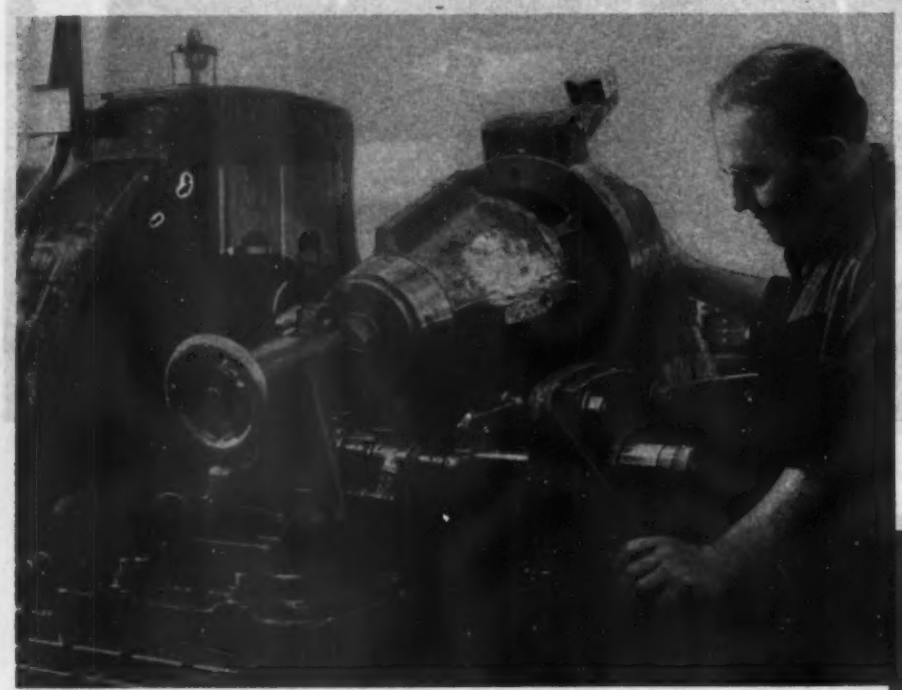
THE TAIL CONE of a naval torpedo constitutes the rear section of the afterbody assembly and carries four control vanes with the horizontal and vertical rudders, as well as the outboard bearings for the propeller shafts. It is machined from a heavy steel forging in a series of operations which require a number of unusual fixtures. Some of these are shown in the accompanying illustrations.

Tail cone forgings first are rough and semi- finish bored, faced and turned at each end. Then the tapered surfaces between the four vane ribs are rough machined in a shaper to match the tapered surfaces at each end. A double-head Rockford Hy-Draulic shaper is used for this operation. Two fixtures are set-up on the tilted table of this shaper, so that the two forgings can be machined at the same time. These

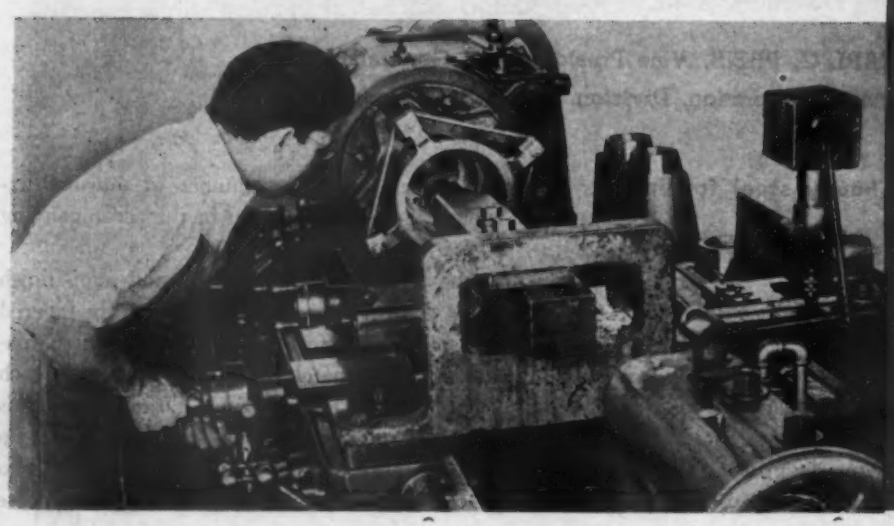
fixtures are indexed automatically between each stroke of the shaper to give a feed of about 0.020 to 0.025 in. per stroke. The forgings are rough shaped, then the vane ribs are rough milled before the forgings are returned to this machine for finishing the tapered area between the ribs. The first roughing cut varies in depth between 1/16 in. and ¼ in. depending on the accuracy of the forging, and the accuracy with which the forging has been centered in the preceding operations. Roughing cuts are taken at a speed of about 30 to 35 strokes per minute, leaving about 0.015 in. of stock for a finishing cut which is taken at 45 strokes per minute. High-speed tool bits are used for the operations. Each forging is held on an arbor with two centering plates. The outer end of the arbor is supported in an outboard bearing bolted to the base of the fixture. This bearing is removed when work is to be changed on the arbor. The forward end of each arbor carries a wormwheel, and a shaft connecting the two fixtures carries worms which drive these wheels for indexing the work between cutting strokes. A clutch on the shaft connecting the worms can be slipped for setting up the work for correct indexing.

Another tilted fixture is used for milling the two sides of each of the vane ribs. This milling operation is performed on a Kearney & Trecker "Simplex" hydraulic miller, using a fixture which supports the work in such a manner that the lower rib is horizontal. Two high-speed steel straddle mills machine the sides of the rib and the ½-in. matching radius in two cuts. The roughing cut is taken at 30 r.p.m., with a feed of 0.950 in. per min. The finishing cut is taken at 37 r.p.m. with a feed of 1/18 in. per min. The fixture is indexed by hand to bring each of the four ribs successively into position for milling cuts.

In a similar set-up on another machine, each of the four ribs is slotted in two operations. The rough



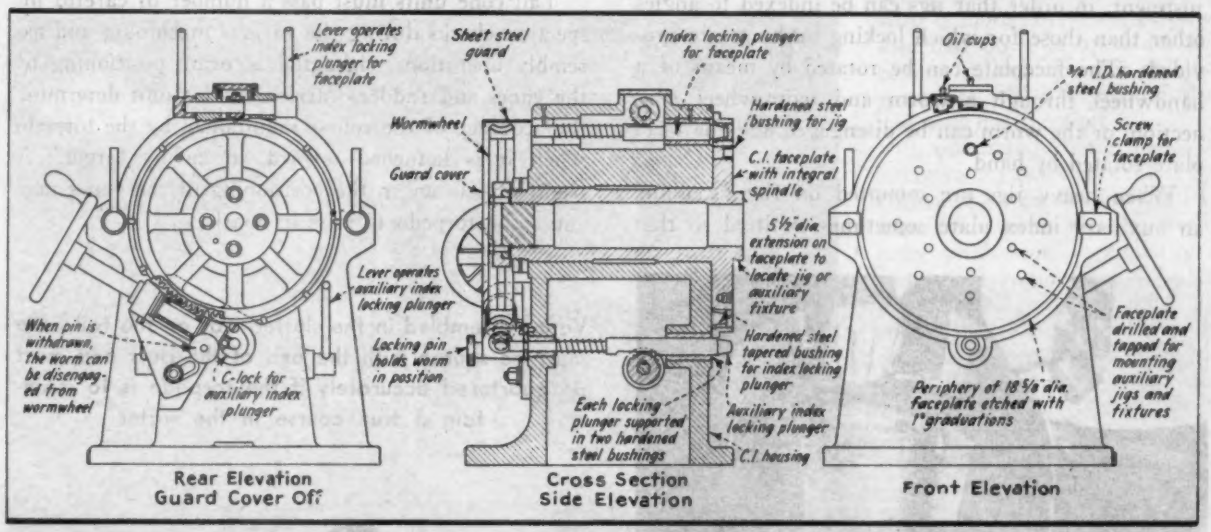
Heavy-duty fixtures insure accuracy of milling operations on the tail cones. Similar set-ups are used for straddle milling the ribs and for slotting them for the vanes

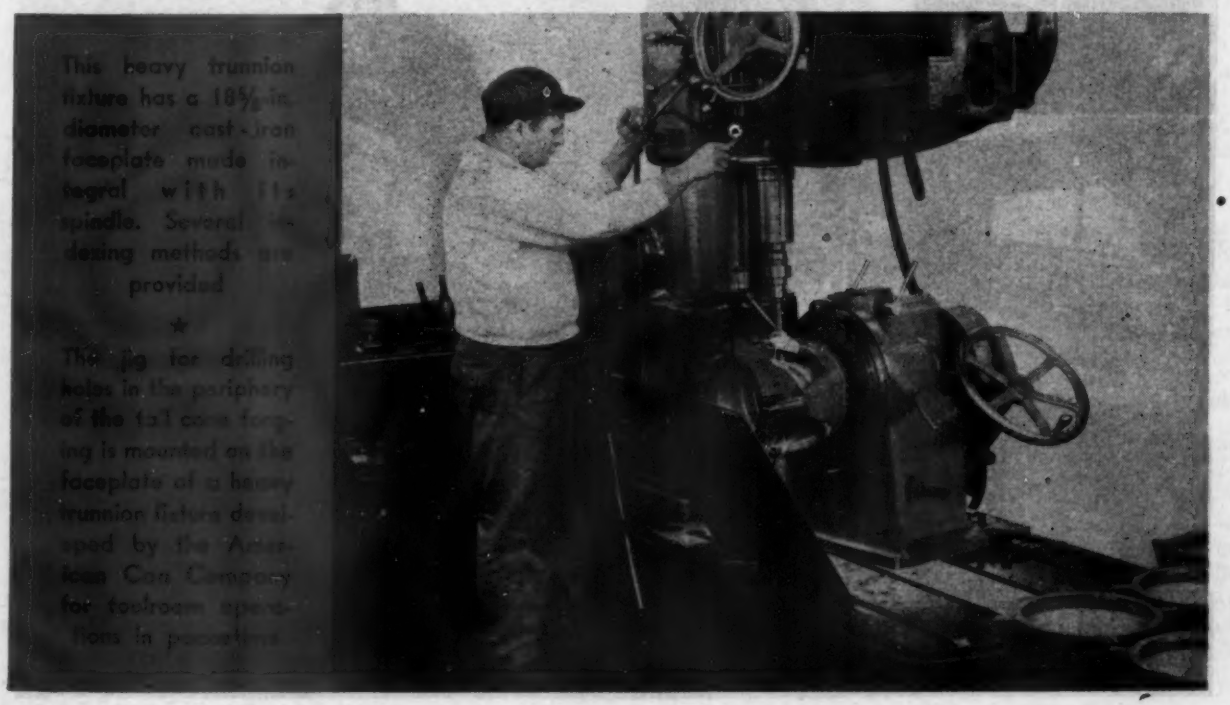


The stepped taper bore of the tail cone forging is rough and finish bored in Monarch-Keller lathes, with the path of the boring bit controlled by a sheet metal templet

slotting operation is taken with a 5-in. diameter cutter at 46 r.p.m. with a feed of 1.20 in. per min. This cut leaves 0.010 in. stock in each side of the slot for a finishing cut. After a roughing cut has been taken in each of the four ribs, the forging is returned to the shaper for finishing the tapered surfaces between the ribs. The four ribs then are finish milled on the sides and two of the ribs are milled on the ends before the forgings are returned to the slotting miller for finishing the vane slots. A heavy sulphur base cutting oil is used for the milling operations. The high-speed steel slotting cutters have been found to stand up better when given a light nitriding treatment after hardening. In most cases, nitrided slotting cutters seem to have a life five to six times the life of cutters heat-treated in the usual manner.

Finish boring operations in the tail cone forgings are performed in 18-in. Monarch-Keller lathes on which a templet controls the transverse movement of the cross-slide when the carriage is moved longitudinally. The heavy boring bar used for this operation is mounted on the compound slide of the carriage to permit fine adjustment of the tool. To minimize vibration, this bar is supported at the rear end in a frame carried across the rear wings of the carriage. There are six steps in the tapered bore. This bore is semi-finish machined in one lathe, and then finished in another lathe after the outside surfaces have been finished. Carbide-tipped bits are used for both boring operations. The roughing operation is performed at 74 r.p.m. with a feed of 0.943 in. per min. The depth of cut when roughing varies with the forging,


Lever operates index locking plunger for faceplate
Sheet steel guard
Index locking plunger for faceplate
Oil cups
¾" I.D. hardened steel bushing
Wormwheel
Hardened steel bushing for jig
Screw clamp for faceplate
Guard cover
C.I. faceplate with integral spindle
5½" dia. extension on faceplate to locate jig or auxiliary fixture
Lever operates auxiliary index locking plunger
When pin is withdrawn, the worm can be disengaged from wormwheel
C-lock for auxiliary index plunger
Locking pin holds worm in position
Hardened steel tapered bushing for index locking plunger
Faceplate drilled and tapped for mounting auxiliary jigs and fixtures
Each locking plunger supported in two hardened steel bushings
Auxiliary index locking plunger
Periphery of 18 5/8" dia. faceplate etched with 1° graduations
C.I. housing
Rear Elevation Guard Cover Off
Cross Section Side Elevation
Front Elevation



This heavy trunnion fixture has a 18⅝-in. diameter cast-iron faceplate made integral with its spindle. Several indexing methods are provided

★

The jig for drilling holes in the periphery of the tail cone forging is mounted on the faceplate of a heavy trunnion fixture developed by the American Can Company for toolroom operations in producing

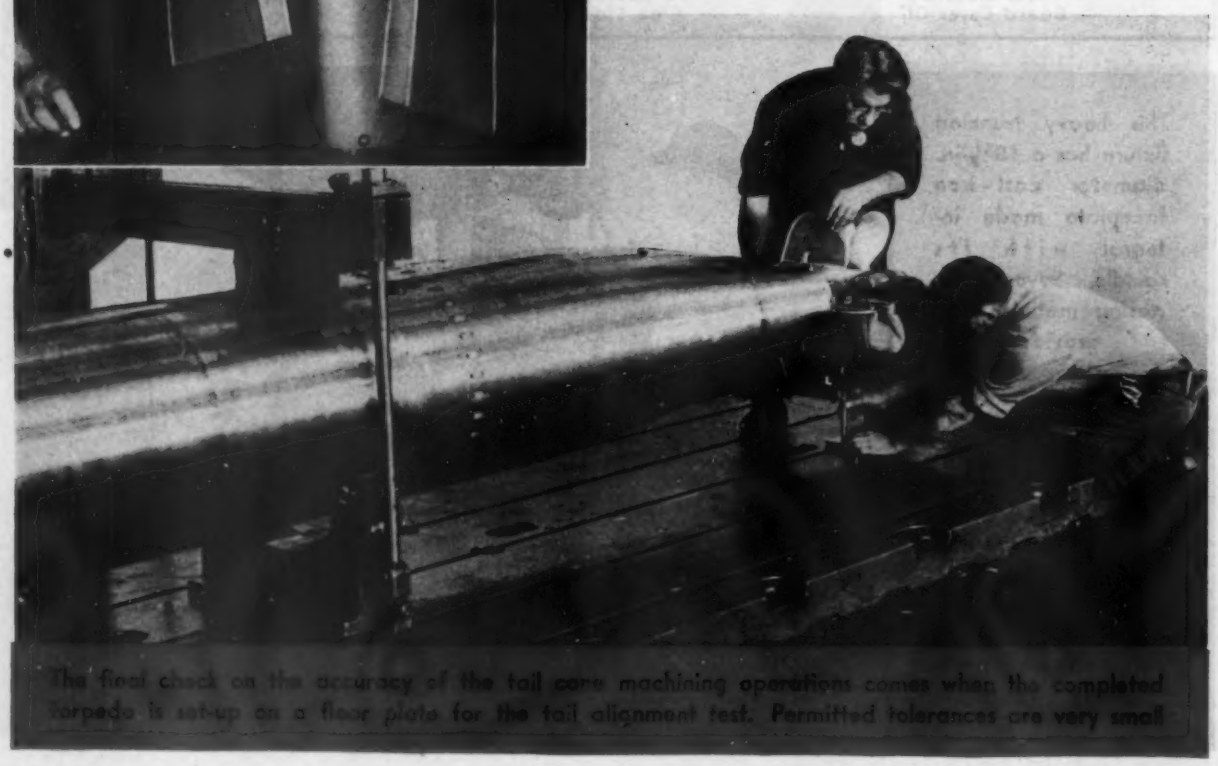
but averages about 0.080 to 0.130 in. Finishing cuts are taken at 74 r.p.m. with 0.572 in. per min. feed. Depth of the finishing cut is 0.100 in. The carbide-tipped tool bits have an average life of about eight to ten forgings on the roughing cuts, and about ten to twelve forgings on the finishing cuts. Diameters of the various bores must be held within 0.010 in. and the length of each of the six steps must be within plus or minus 0.005 in.

The jig for drilling holes around the periphery of the tail cone is carried on the faceplate of a heavy trunnion fixture set up on the base of a Cincinnati-Bickford radial drill. Design details of this trunnion fixture are shown in an accompanying sketch. It has a 18⅝-in. diameter faceplate to which a wide variety of jigs can be mounted for different operations. The faceplate is fitted with hardened steel taper bushings for a locking plunger. The periphery of this faceplate is graduated with 1-deg. markings for angular adjustment, in order that jigs can be indexed to angles other than those for which locking bushings are provided. The faceplate can be rotated by means of a handwheel through a worm and wormwheel connection, or the worm can be disengaged and the faceplate rotated by hand.

When heavy jigs are mounted on the faceplate, an auxiliary index plate sometimes is fitted so that an auxiliary plunger at the bottom of the fixture can be used to lock the faceplate in the various desired positions. Each fixture or jig designed for mounting on the faceplate of this trunnion fixture has a 5½-in. diameter hole for mounting over a plug provided in the center of the faceplate. There also is a pin provided in each of the jigs to fit in a hardened bushing in the faceplate so as to line up with the jig with the graduations on the periphery of the faceplate. A tailstock unit is provided with each trunnion fixture so that an outboard support is available when a heavy jig extends a considerable distance from the faceplate. Before the war, trunnion fixtures of this type found considerable use in the machine shops of the various plants operated by the American Can Company, and they now are being used to advantage in war production. They are suitable for layout and inspection operations, as well as for various drilling and milling operations on heavy parts.

Tail cone units must pass a number of careful inspection checks during the various machining and assembly operations, since the accurate positioning of the vanes and rudders carried on this unit determine the accuracy of the course maintained by the torpedo when it is launched toward an enemy target. A slight inaccuracy in the positioning of the vanes may cause the torpedo to miss its mark.

Vanes assembled in the slotted ribs on the tail cone must be square with the axis of the part and must be quartered accurately if the torpedo is to maintain a true course in the water



The final check on the accuracy of the tail cone machining operations comes when the completed torpedo is set up on a floor plate for the tail alignment test. Permitted tolerances are very small

Army Field Shops Repair and Rebuild Ordnance Equipment

BY WILLIAM J. HARGEST, AMERICAN MACHINIST WAR CORRESPONDENT

United States Army Ordnance engineers have designed and built maintenance depots in the European theater of operations for complete overhaul of automotive engines, motor cars, artillery and combat vehicles. Engine shops are set up for line production and do an annual business of millions

Engine blocks are water tested for cracks, repaired if necessary, and the cylinders are bored and honed on machines set up adjacent to the conveyor

SOMEWHERE IN ENGLAND—Ordnance maintenance in the European theater of operations has become big business—saving money, time and shipping, and what is more important, helping to insure that no vital operation will fail, because of vehicles that will not run, guns that will not shoot, instruments that will not function.

In one month, more than 3,000 automotive engines were rebuilt by Army Ordnance shops in the United Kingdom. Complete factory overhaul by mass production methods on radial and inline engines for vehicles from jeeps to PT boats is done in large maintenance shops simulating the production lines in Detroit. In addition, these shops inspect, repair and test many individual engine accessories, and other assemblies including transfer cases and transmissions.

Three major shops in England engaged in this work are doing a $50,000,000 annual repair business. In another field, Ordnance tire repair shops are doing over $500,000 business monthly in the reclamation of military tires.

During recent months, a great many modifications in design and construction have been standardized for existing models of tanks and other combat vehicles. At one ordnance base shop alone, soldier welders, machinists, blacksmiths and mechanics labored 166,000 man-hours, to complete before D-day 53 different modifications on more than 1,000 tanks.

Hundreds of Vehicles Weekly

At another ordnance shop, the reconditioning of general purpose vehicles, from jeeps to heavy trucks, which includes a complete technical inspection and the replacement of worn out assemblies, is being accomplished at the rate of 350-400 vehicles weekly. The same kind of work is also being carried out as normal routine in scores

of mobile field repair shops.

There are five echelons of maintenance in the Ordnance operation: First is preventive maintenance, performed by the user; Second is performed by the using unit through specifically designated personnel. The third echelon is performed by Ordnance. With each major unit there is an ordnance maintenance company, equipped to serve all types of ordnance, chiefly by replacement. Units are highly mobile and accompany the field organization they are serving.

Fourth are the Ordnance heavy maintenance companies which are fully equipped with tools and completely stocked with parts and materials; therefore, they are less mobile than the third group. A fourth echelon unit operates as a pool of maintenance facilities for several combat divisions.

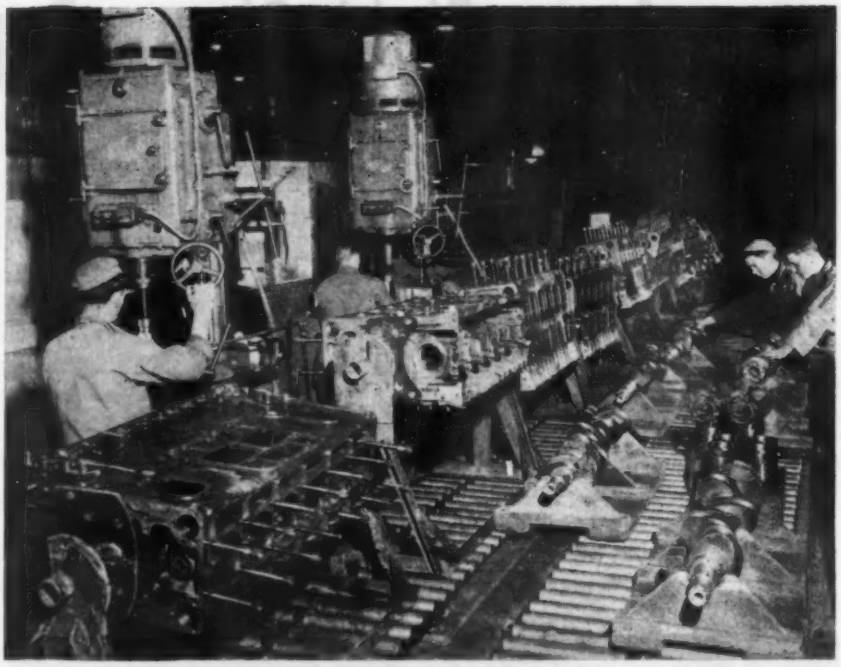
The fifth echelon is base maintenance performed by Ordnance as relatively permanent installations where it is possible to install heavy machinery, set up production methods of operation, and draw on a complete range of ordnance parts and supplies. Unserviceable parts and assemblies that were taken out of ordnance equipment and replaced in the lower echelons eventually get back to base maintenance shops where as many as possible are reconditioned and reclaimed for further use. The wide range of tools and equipment available make possible the reclamation of every type of ordnance, and, in some cases, the actual manufacture of parts on a production basis.

Large Depot Built by British

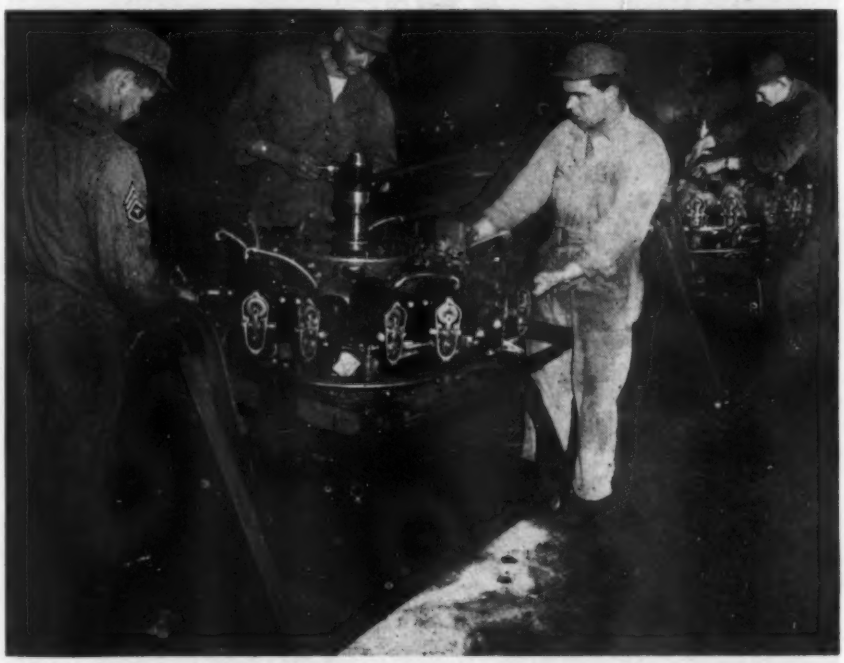
Maintenance depot No. 3 is the latest fifth echelon maintenance shop established in the United Kingdom. It was designed by the United States Army Ordnance and built by the British, being turned over to us in January, 1944. Practically all tools and machines in this shop are of American manufacture. Here are repaired automotive engines, tanks, combat vehicles and artillery.

The chief item maintained in the engine shop is the Continental R-875 radial automotive engines for the medium tank. Current production is 15 engines a day, although when fully staffed and working on a 24-hour basis, production is double this figure. The shop completely overhauls 170 train units for light and medium tanks in one month; also, 1,151 bogie wheels for mobile artillery, 1,048 electrical units, and 385 carburetors and fuel pumps.

The engine shop at this base operates on the production line principle.



Two complete engine repair lines are set up in the base engine shop at the largest maintenance depot in Great Britain. Each diesel engine is mounted on a swivelling cradle for assembly of parts



Radial engine crankcases are mounted on fixtures that can be swivelled to any angle in horizontal and vertical planes for final assembly. Because of close tolerances, parts are reused in the same engine

The engines are first disassembled into 123 different parts, and each part is thoroughly examined by inspectors, who are highly trained radial engine mechanics. These men determine the need for repair or replacement of the individual cylinder, bearing, valve, cam, gear or any other part. Because of the close tolerances to which all parts of these radial engines are fitted, it is desirable that every part found serviceable goes back into the same engine. Therefore, all parts are tagged, during disassembly, with an engine code number. They are placed in special carts which carry them down

When sufficient engines have assembled they are torn down, the parts placed in mesh baskets and degreased in the first station on the shop conveyor's line

Engines with cylinder wear greater than 0.008 in. are completely overhauled. Individual parts are repaired at locations within the conveyor line. Repaired parts are fed to the conveyor line when finished

the inspection and rebuilding lines to the point where assembly begins. Parts requiring repair or modification are taken from the cart to the appropriate subassembly rebuild section.

There has been much development work done in this shop in devising tools, jigs and fixtures to reclaim parts, which ordinarily would be scrapped, to overcome shortages of many items. Included in the list are gears, connecting rods, crank cases and bearings. At present, every gear in the transmission of the M-4 tank is being reclaimed by a combination process of metallizing, welding and machining.

An example of improvisation occurred at this shop when much difficulty was experienced with rocker arms in the radial engine beating against the covers, causing failure in many instances. A report was made to the factory at home, but in the meantime it was necessary to take drastic action to correct many engines coming from the shop. A solution was found by making a new cover with more head clearance. It was cast from aluminum obtained from scrap cylinders and was then machined. Covers are now actually being produced at the rate of 100 per day. This renovation required that the end of the rocker arm extension be milled off because it was hitting against the cover. Several machines were tooled with jigs and fixtures to mill, drill and countersink the end of the rocker arm extension.

Engines Require Bearings

About one half of the radial engines passing through this shop require the replacement and machining of the rear main bearings. The supply of these bearings from home proved to be a bottleneck, and rather than deadline the engines, soldier mechanics built a portable boring tool for maintaining perfect alignment between the rear main bearing and two crankshaft bearings in the nose section of the engine.

In another instance, mechanics obtained a machine originally designed to bore connecting rods for in-line engines, and adapted it for boring articulating rods of the radial engine. In still another instance, a bench lathe was equipped with a special chuck to hold exhaust manifold elbows so they could be faced. Previously, these elbows either had to be scrapped because of undue warpage, or reclaimed laboriously by filing, scraping and sandpapering. Now each elbow is reclaimed in 2 min., floor-to-floor time.

Many Parts Reclaimed

In all cases, systems of parts reclamation have been set up, salvaging units that normally would go to the scrap pile. This has required extensive use of metallizing and welding, as well as the improvisation of tools, jigs and fixtures—and even testing devices—not obtainable on the commercial market. In some instances, parts in short supply have been manufactured, the tools, jigs, fixtures and molds for such fabrication being made in the maintenance depots.

Operations at other maintenance depots follow a similar pattern, as for instance at Depot No. 1. Here motor car and truck engines of all types are overhauled. Engines are grouped and

classified according to type, and when sufficient numbers are ready, they are sent through the shop for repair. A production schedule of a definite number of engines per day is set up. Spare parts, based on known mortality rates for different engines, are ordered, built in the shop, or obtained from cannibalized units. Then, and only then, are repairs begun.

Engines Completely Disassembled

The engines are disassembled after being degreased in steam rooms, and individual parts of each engine placed in a large mesh basket. These baskets are started along a conveyor line, first entering a degreasing hood where all parts are thoroughly cleaned. The engine blocks continue along a conveyor, while engine accessories and individual parts are sent to sections in the shop allocated for the repair of each item.

Engines repaired at this depot include those for Willys, Ford, Chevrolet, and Dodge cars and jeeps and GMC trucks. An average of 2,000 engines per month are repaired, resulting in an estimated annual saving in engine supply of approximately $7,200,000.

The No. 2 depot is one of the largest in the United Kingdom and was built by the British and turned over to the United States in 1942. It has a number of individual shops, including those for rebuilding diesel and gasoline automotive engines, recapping tires, rebuilding combat vehicles, repairing small arms and artillery, and shops for servicing new equipment imported for the United States.

During July, 1944, 450 complete engines, including all accessories, were repaired in this shop. Daily production totals 72 engines; however, when the shop is fully manned, it is tooled to repair 3,000 engines per month, operating on a 24-hour basis.

Dwarfs Large Motor Repair Shops

The vehicle repair shop at this maintenance depot dwarfs the largest automotive repair shops seen by this correspondent in the States. A fully equipped machine shop occupies a bay running the entire length of the building. Here repairs are made to running gear, and parts are fabricated when not available from Ordnance supply. Many of the machines are British made and supplied on reverse lend-lease. British civilians operate the machines and work on the assembly floor, augmenting an Ordnance maintenance battalion that forms the major part of the staff.

To date, no fifth echelon ordnance depots have been established in Normandy, although preparations are being made to transfer one or more of the units from the United Kingdom to France. However, third and fourth echelon units have been established there already. Tanks, tank-destroyers, tank-transports, trucks, artillery, small arms, scout cars and motorcycles are sent back from second echelon units, and are repaired mainly by replacing parts. In one instance, an M-4 tank was hauled back to the fourth echelon base, where a maintenance crew replaced an engine, between midnight and breakfast. This was rather a short time, under the circumstances, for the pistons had seized and the engine could not be turned over to disconnect housing bolts.

Ordnance is converting many captured enemy vehicles for use by the U. S. Army. A big vehicle park has been set up in Normandy, where enemy vehicles are sorted, inspected, repaired, and after they have been put in full operating condition they are dealt out for use by civil affairs groups, units evacuating prisoners, motor pools, and for general transportation where most needed.

Power-train units, including transmissions, drive shafts, axles, brakes and wheels are overhauled by fifth echelon units and sent to third and forth echelon bases on demand of Ordnance supply

Also Examine Nazi Ordnance

A most important technical function carried out by Ordnance experts in France is the collection, examination and reporting of all sorts of Nazi ordnance recovered on the battlefield. Also, Ordnance intelligence teams are scavenging the combat area for valuable data on enemy equipment.

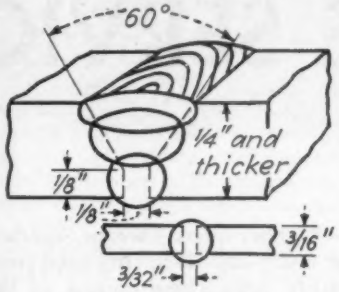
The tools and equipment furnished by American industry, and the long months of training for ordnance personnel are now paying off, and with compound interest. These, together with ingenuity, determination, resourcefulness of both officers and men, maintain the high standards on ordnance service in the field.

Procedures for High-Speed Butt Welding—III

COURTESY THE LINCOLN ELECTRIC COMPANY

SINGLE V-GROOVE

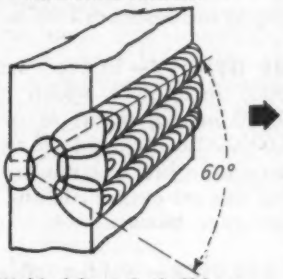
Flat Position



Welded from One Side Without Back-up Strip

SINGLE V-GROOVE

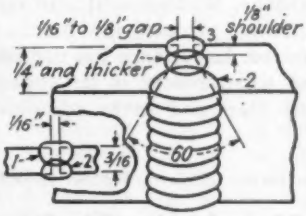
Horizontal Position



Welded from Both Sides

V-GROOVE

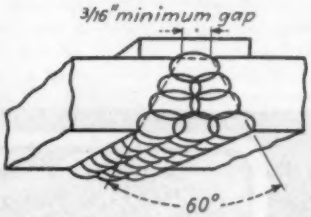
Vertical Position-Welded Up



Without Back-up Strip. Welded from One or Both Sides

V-GROOVE

Overhead Position



With Back-up Strip

Thickness	Electrode Size[1]	Current Amps	Electrode Melt-off[2] In./Min.	Arc Speed In./Min.	Passes or Beads[3]	Ft. of Joint[4] per hr.
3/16	3/16 E6010 3/16 E6011	180	8¾	13	1	65
1/4	5/32 E6010 5/32 E6011	150	10	8	1st	20
	3/16 E6010 3/16 E6011	200	9½		2nd	
5/16	5/32 E6010 5/32 E6011	150	10	8	1st	19
	1/4	250	8		2nd	
3/8	5/32 E6010 5/32 E6011	150	10	8	1st	17
	1/4	300	9½		2nd	
1/2	5/32 E6010 5/32 E6011	150	10	6	1st	12.5
	1/4	350	11½		2nd & 3rd	
3/16	5/32	130	9	10	2	25
1/4	5/32	130	9	7	2	17.5
5/16	5/32	140	9½	9	3	14
3/8	3/16	170	8½	7	4	10
7/16	3/16	170	8½	7	‡	8
1/2	3/16	170	8½	7	‡	6.2
5/8	3/16	170	8½	7	‡	4.0
3/4	1/4	250	8			
	3/16	170	8½	7	‡	3.9
1	1/4	250	8			
	3/16	170	8½	7	‡	2.4
3/16	5/32	130	9	10	2	25
1/4	5/32	130	9	7	2	17.5
5/16	5/32	140	9½	5	2	14
3/8	3/16	150	8	3	2	10
7/16	3/16	170	8½	5	3	8
1/2	3/16	170	8½	4	3	6.2
5/8	3/16	170	8½	3	‡	4
3/4	3/16	170	8½	3	‡	2.9
1	3/16	170	8½	3	‡	1.7
3/16	3/16	150	8	7	2	15
1/4	3/16	150	8	7	3	12.5
5/16	3/16	170	8½	7	4	9
3/8	3/16	170	8½	7	5	6.7
7/16	3/16	170	8½	6		5.2
1/2	3/16	170	8½	6		4.1
5/8	3/16	170	8½	6		2.9
3/4	3/16	170	8½	6		2.1
1	3/16	170	8½	6		1.3

[1]Except where noted otherwise, electrodes and polarity follow the practice in table "Electrodes for Flat-Position Welding," published in an earlier number.
[2]For the first pass.
[3]See table "Electrodes for Flat-Position Welding".
[4]100 percent operating factor.
3/16-in. plate does not require V-groove and square-edge preparation can be used.
‡Number of passes will depend upon the operator.

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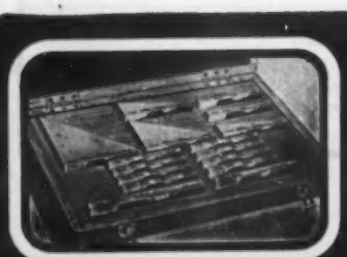
Set No. 38B (Thin Blocks) $155.00
Set No. 14A (Angle Blocks) $450.00



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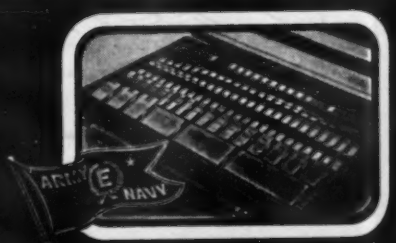


Procedures for Arc-Welding Sheet Metal

COURTESY THE LINCOLN ELECTRIC COMPANY

FACTORS governing the high-speed welding of sheet metal in gages from No. 10 to No. 18 are: (1) type and size of electrode, (2) current, (3) fit-up of joint, and (4) position in which the joint is welded.

As in welding heavier material by the high-speed, or "Fleet Welding" method, it is essential to hold a short arc with the electrode coating almost touching the plate. In the flat position, greater ease of welding may be obtained by lightly touching the coating to the work. The angle of the electrode should be about the same as in welding heavier plate for the same type of joint, namely 60 to 80 deg. from the horizontal in the direction of travel.

Within the limits of good weld appearance, the speed of welding will increase with current applied. Good fit-up is important because as the gap becomes greater the current must be decreased to avoid burn-through. For example, if a 1/16-in. gap is permitted when welding 16-gage metal, the permissible welding speed may be only 30 percent of that allowable when there is no gap. If only small sections of the joint have a gap, "whipping" the arc along the seam at places where gaps occur will reduce the tendency to burn through.

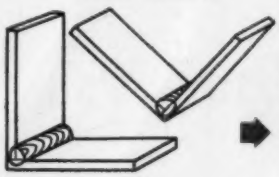
Current values for welding five types of joint in the flat position are given in the tables. These data serve as a guide to the welding operator. The actual current used should be determined by trial, employing the highest value without burning through or melting away the edges of the joint. These values, furthermore, pertain to welding operations in which uniform tight fit-up can be maintained.

For maximum welding speeds, minimum distortion and low electrode consumption, sheet-metal joints should be welded about 45 deg. downhill and with the same, or slightly higher, currents as used in flat procedures. Welding downhill decreases the tendency to burn through a joint that has poor fit-up, and generally produces a flatter and better appearing weld. Procedures for vertical-position and overhead-position welds (not given) call for electrode sizes, currents, and arc speeds identical with, or quite similar to, those presented for flat-position welds on material No. 18 and No. 14 gage metal, but the values for use with No. 12 and No. 10 gage sheet show decreases.

BUTT WELDS

No gap for 12-gage and thinner; 1/16-in. gap for 10-gage if complete penetration is required

FILLET WELDS

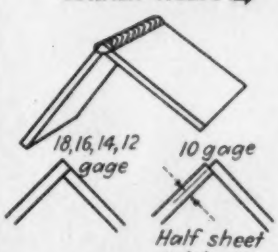


Fit-up: no gap

LAP WELDS

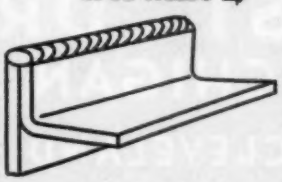
Flat Downhand—no gap

CORNER WELDS



Recommended Fit-up

EDGE WELDS



Fit-up: no gap

Sheet Gage	Electrode A.W.S. Class.	Electrode Polarity	Current Amps.	Arc Speed In./Min.
18	3/32 E6010	Neg.	45	25
	3/32 Mild Steel[1]		60	22
16	1/8 E6010	Neg.	80	30
	1/8 E6011	Neg. or A.C.		
14	1/8 E6010	Neg.	100	30
	1/8 E6011	Neg. or A.C.		
12	5/32 E6010	Neg.[2]		
	5/32 E6010	Neg. or A.C.	140	30
10	3/16 E6010	Neg.[2]	180	24
	3/16 E6011	Neg. or A.C.		
18	3/32 Mild Steel[1]	Neg. or A.C.	65	14
16	3/32 Mild Steel[1]	Neg. or A.C.	75	14
14	1/8 (Note 3)	Neg. or A.C.	100	14
12	1/8 (Note 3)	Neg. or A.C.	120	14
10	5/32 (Note 3)	Neg. or A.C.	150	14
18	3/32 Mild Steel[1]	Neg. or A.C.	75	20
16	1/8 (Note 3)	Neg. or A.C.	100	20
14	5/32 (Note 3)	Neg. or A.C.	150	20
12	3/16 (Note 3)	Neg. or A.C.	170	20
10	3/16 (Note 3)	Neg. or A.C.	200	18
18	3/32 E6010	Neg.	70	40
	3/32 Mild Steel[1]	Neg.	75	32
16	1/8 E6010	Neg.	90	40
	1/8 E6011	Neg. or A.C.		
14	5/32 E6010	Pos.	120	30
	5/32 E6011	Pos. or A.C.		
12	3/16 E6010	Pos.	170	30
	3/16 E6011	Pos. or A.C.		
10	3/16 E6010	Pos.	180	26
	3/16 E6011	Pos. or A.C.		
18	3/32 E6010	Neg.	60	50
	3/32 Mild Steel[1]	Neg.	70	40
16	1/8 E6010	Neg.	100	50
	1/8 E6011	Neg. or A.C.		
14	5/32 E6010	Neg.	110	45
	1/8 E6011	Neg. or A.C.		
12	5/32 E6010	Neg.	120	45
	1/8 E6011	Neg. or A.C.		
10	3/16 E6010	Neg.		
	5/32 E6011	Neg. or A.C.	160	40

Footnotes:
[1]The recommendation given by Lincoln Electric Company is a proprietary electrode for which the weld metal has properties similar mild steel.
[2]This A.W.S. electrode is generally used only as positive, but negative polarity is sometimes recommended for sheet metal.
[3]The proprietary electrode specified produces a weld metal with these properties: 71000-82000 p.s.i.; 17-22 percent elongation in 2 in. A.W.S. electrodes that might be used are: E6012, E6013, E7011, E7012.

TWIST DRILLS

IMMEDIATE STOCK DELIVERIES ON STANDARD DRILLS

ENGINEERS AND PRODUCERS
OF QUALITY CUTTING TOOLS
SINCE 1917

AMPCO TOOLS

AMPCO TWIST DRILL CO.

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CHICAGO . DETROIT . CLEVELAND . PHILADELPHIA

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Gaging Business

Merely a Mirage

Reconversion continues to be a "myth." Despite heavy cut-backs in war programs in August, only two of the affected manufacturers reviewed by the Production Executive Committee have been able to apply for permission to engage in civilian production. The others will have to use the facilities and employees freed from cut-backs to do other war work.

August's heavy volume of cut-backs included reductions in land mine production, radio and radar equipment, munition components, as well as the widely announced heavy cut in the plane program and the reduction in the torpedo program. Yet, the amount of manpower freed for civilian production was virtually nil.

Military pressure on manpower arises from continued lags in production schedules for tires, trucks, tanks, heavy guns and ammunition, signal equipment, shipbuilding, and cotton duck cloth. Lags in all these programs is laid to manpower shortages in part, but they also arise from recent step-ups in schedules. For this latter reason, experts on military production figures warn others to regard the percentage declines behind schedules very warily.

Changes Cause Plane Drop

The August drop in plane production from around 8,200 planes to 7,800 planes is not alarming, since it was largely due to changes in the Army and Navy methods of accepting completed planes. Previously, the military would accept planes as "delivered" once a particular plant had finished its work on such planes, even though the planes would then have to be shipped to other plants for further installations or modifications. Now the military are requiring most plants to finish all installations, such as adding de-icers, before the plane is acceptable as a delivery. This means that the picture in August on the new basis is probably more favorable than when total acceptances were higher.

The planned cut in plane production at the end of the German war is reported to be about 40 percent. At that time, over-all munitions cuts will release 4,000,000 war workers, many of whom would be let out of plane plants.

A Four-Year Low

July's machine tool shipments represented the lowest monthly total since July, 1940, and probably reflected the drop in net incoming orders. Disappointing results of WPB's order permitting purchase of machine tools for use in postwar production are reported due to: (1) uncertainty over disposition of government-owned machine tools, and (2) some belief that prices for new tools may break under pressure of the dumping of federal surpluses. Pending legislation seems to be omitting all the ideas that had been presented in the hopes of making for an orderly market for items affected by government surpluses.

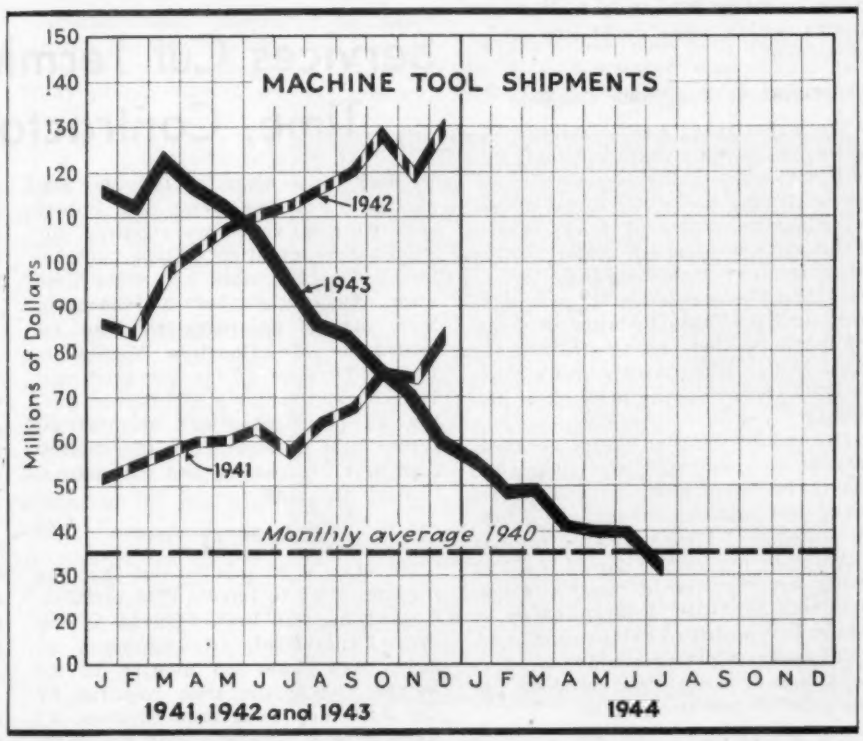
Used Equipment Sales Up

It is significant that sales of used equipment are on the uptrend, and is currently running at around $28,000,000 a month, including sales of privately owned second-hand items. Volume of used equipment sales may rise further as a result of DPC's newly announced policy of permitting credit sales of government-owned items, and due to the reported acceleration of Army and Navy processing of its items for the purpose of deciding which are surplus and which are not. However, the military has a tremendous job to do in this respect, so that peak offerings of such surpluses are still far off.

Thus far, foreign orders for new tools and equipment have also been disappointing, and this is also attributed to the surplus question in some measure, although vacillating government policies on foreign trade are held to be another contributing factor. Meanwhile, the British government is reported to be sowing postwar trade goodwill by purchasing two or three years' output of certain products of many foreign nations.

Coast Steel Drops

A serious situation in steel plate has developed on the West Coast where Kaiser's Fontana plant has been reporting a steady month-to-month drop in plate output. Production has fallen from 33,000 tons to 19,000 tons. The situation is so serious that WPB's Steel Division Director Norman W. Foy, has gone to the coast.



Down Again—Tool shipments, continuing the 16-month downward trend, dropped below the monthly average of the last prewar year with a July total of $33,916,000. This was 18.2 percent below June's $41,471,000. July cancellations were $4,056,000, 6.8 percent below June's $4,354,000. Net new firm orders dropped 33 percent to $33,224,000 in July from the June level of $49,578,000. Backlog remained relatively unchanged, $194,588,000 at July-end as against $194,450,000 at the end of June. Labor force used in tool production dropped to 59,000 men in July, from 63,700, while average work week remains high at 50.3 hours, same as a year ago when 102,900 were employed in the industry

Bottleneck of Heavy Duty Tires Hamstrings Truck Program

Manpower waste, labor shortage and continuous pressure of other munitions programs in Akron aid shortage; truck schedule now 80,000 in arrears; commercial vehicles suffer

WASHINGTON—The nation's number-one bottleneck, heavy duty tires, has also become the nation's number one "mess." Industry and government observers agree that the war may be over before the bottleneck is broken, and that in the meantime truck output will suffer due to lack of tires.

The heavy duty tire bottleneck stems from: (1) waste of available manpower; and, (2) shortage of labor. Labor is wasted due to union restrictions on daily output, plus the fact that about 1,400 experienced tire workers are now employed on other war work in Akron. In order to permit daily production quotas to be increased, the union wants written assurances from management that increased wartime output will not be used as a wage-cutting argument after the war. War Manpower Commission says that it is in process of taking steps to bring about upping of tire quotas, which alone could lift output 15 percent.

Munitions Programs Compete

The experienced tire workers doing other Akron war work are loathe to return to tire-making because the latter work may be more difficult or pay less than their present work, besides involving questions of seniority. The Army or Navy could help the situation by cutting back some of its munitions programs in Akron in order to divert manpower to tire-making. Instead, the Navy has just increased Akron's share in the "Corsair" plane production program.

Meanwhile, the War Manpower Commission is understood to be using kid gloves in its referral drive to divert manpower into the tire-making plants. In trying to fill an estimated need of 11,100 men in the tire plants, 4,800 of whom are required in heavy tire production, the WMC District Office in Akron is reported to defer to the available workers' preference to do other work and does not insist on their taking jobs in the tire plants.

Insist on Spares

To make matters worse, the Army continues to insist that trucks be shipped with "spares" in order to be considered as a delivery. On the average, required spare parts including other critical truck components, such as axles and transmissions, are equivalent to about 20 percent of the material shipped in completed units. Army critics say that the concentration of large numbers of heavy trucks in France could permit the easy cannibalizing of damaged trucks, and by thus recovering usable parts for other vehicles the Army's spare requirements could be reduced.

WPB's Office of the Rubber Director has also contributed to complications by announcing the establishment of new ratios of the amount of synthetic rubber to natural rubber usable in medium truck tires. It now looks as if such operational difficulties arising from the new rubber formula will be one more obstacle for the fourth quarter medium truck program to hurdle. Tire shortages now promise to hold fourth quarter medium truck output to 33 percent below schedules.

The heavy duty tire shortage has put the Army's truck schedule behind by 80,000 units thus far. At the same time, commercial truck operations have been impaired by the tire shortage, with some 1,600 commercial vehicles laid up due to tire shortages.

TWO TIRE WORKERS AVAILABLE

AKRON—Two experienced tire workers, jailed for assaulting a fellow worker for trying to exceed the union's daily quota on the number of tires which may be produced by each worker, would like to "help the war effort." They propose to return to tire-making, if they are released from jail where they are scheduled for a six months' stay.

Meanwhile, union members see to it that the tire making machines at Goodyear's plant formerly manned by these two men are kept idle as a sympathetic gesture toward the two imprisoned workers.

Services Cut Termination Handling Time; Contractors Lag on Claims

NEW YORK—Although the War Department and the Army Air Forces are reducing the time required for handling termination claims, contractors are taking more and more time after termination before presenting their claims, according to data revealed by Mr. Charlton MacVeagh, Deputy Director of the Readjustment Division of the Army Air Forces, during an adjustment and termination forum held in New York City before 2,700 war contractors and subcontractors by the AAF.

Cut Handling Time

Mr. MacVeagh pointed out that the time required to handle filed termination claims had been reduced by the War Department, from January to July, 1944, from 2.5 months to 2.4 months, while the time required by the AAF had been reduced from 4.5 months to 3 months during the same interval. Meanwhile, the War Department's terminated contractors were taking 2.9 months' time to submit their termination claims, as against 2.6 months at the beginning of the year, while the time required by AAF's terminated contractors increased from 3.3 months to 4.6 months from the January to July period.

More serious time lags were also pointed out by Mr. MacVeagh, who stated that of 534 termination cases pending from three to six months' time, only 63 termination claims have been filed; while out of 358 cases pending over a year, only 129 claims have been presented.

Aluminum Surplus Heavy

WASHINGTON—The aluminum picture continues to grow progressively worse, with a race going on between WPB officials trying to cut production and the steady drop in requirements. The latest cut-back on August 30 of 30,000,000 pounds of ingot per month brought total monthly output down to 90,000,000 pounds as compared with its peak of 188,000,000 pounds set last winter. Yet the chances are that more cuts will be made.

Right now the only bottleneck item in aluminum is foil, so that there is surplus processing capacity in all other products. But scrap shapes up as the next big aluminum headache. Scrap has been piling up fast and is a drug on the market. Recently, the Metals Reserve Company purchased a large quantity of ingots from secondary smelters to add to its stockpile, as a step toward relieving the situation. However, it is feared that this scrap situation will eventually contribute to further price reductions in ingot aluminum.

Inside Detroit

BY SILER FREEMAN

Recession Cost Manpower

It wasn't many months ago that the tool and die shops in this area were in a bad way. Orders had fallen off and there was little work in sight. Tool and die makers started to walk the streets and the shops fought for their very existence.

Today the situation has changed again. The shops are crammed with new orders. More work than they can handle is in prospect.

And because they were forced to release many of their skilled men in the short recession they had and because they took on production work, the capacity of the shops is estimated now as about one-half of what it was last Fall. And on top of this, the demands for new types of tanks, shells, rockets and big guns threatens to swamp them in the next few months.

Few Unrated Orders Asked

This development comes right at the time the automotive industry is desperately in need of tool room capacity for their reconversion work. Strangely enough, however, the industry has been slow to take advantage of the WPB order permitting them to place their needs for tools and tooling on unrated orders.

A check this week with WPB showed that only a small percentage of the estimated needs for machine tools had been applied for. Under the Nelson order, the companies must screen their requirements through WPB and get its approval before placing their unrated orders. It was learned that of the Big Three, only General Motors has been active. The orders approved to them, however, are small in comparison to their known requirements, only in the neighborhood of two millions in dollar value.

Chrysler has applied for some and the Ford Company has asked for none.

Ordnance Shifts Plans

The reasons for this lackadaisical attitude are somewhat obscure. But an analysis of the situation reveals a few heretofore unknown factors.

First and foremost of the recent developments is the change of heart on the part of Ordnance in selling their tools to prime contractors. Until now, they have steadily refused to sell any tools.

But now Ordnance has notified its prime contractors that they will sell any machinery or tools in the contractor's plant, as of now, providing that the machinery and tools will be kept in operation by the contractor for the duration of the contract. This means that the prime contractor can select the government-owned tools on his production lines which he can use for his peacetime activities, make a deal and wait for the contract to run out or termination and then put them into his own production line.

The prices will presumably be based on the Clayton formula. The order, while official, has not yet been issued formally by Ordnance. It has not been given wide publicity by Ordnance because they fear that when the subcontractors learn that this will apply only to primes, there will be a loud hue and cry for equal treatment for them. It is expected that the next development will be for the subs, too, to be given the right to purchase their machinery.

Gamble on War End

Another reason advanced for failure to process machine tool orders at once is the progress of the war. Many manufacturers see the end of the war so near that they see little reason for placing unrated orders.

A WPB official offered still another reason, as far as the Big Three is concerned:

"Why should they rush to place unrated orders, when they know there is still a great volume of rated orders ahead of them," he asked. "After all, they know that when there is idle capacity, they can walk right into their regular suppliers and tell them what they want and obtain preferential treatment."

Another WPB representative offered the suggestion that perhaps their entire needs are still unknown.

"Take the tools they have stored out in the yards," he pointed out. "How much of that can they actually use and how much must be discarded. They know what tools have been sold, traded and outmoded. But what of those they stored, how many will be in condition?"

Need Manpower to Plan

Speaking of manpower, the automotive executives have been insistent that no development work can be undertaken until they have some technical help released from war work. Most of their engineers, draftsmen and clerical help in their engineering departments are draft-deferred men who only hold these deferments as long as they are on war work.

Last week, the industry began activity to obtain some relief. C. E. Wilson, in a recent talk, bemoaned the fact that the industry would be unable to make the cars in the first quarter because of the failure of government to act promptly. He also pointed to the unavailability of technical men.

Ask to Use Idle Technicians

Pressure has now been placed on the War Manpower Commission to make some changes in regulations and allow the companies to use any idle technicians they may have for postwar work.

One of the high officials of the industry warned WMC that if it persisted in its attitude, that consequent unemployment after the war because of the failure to get ready would be placed directly on its shoulders.

It is estimated that the total number of men involved would be between 2,500 and 3,000 and that this would be a small concession for guaranteeing the pay checks of about 500,000 men after the war.

Spin Test — A spin test machine which simulates the action of a projectile in flight is being used in the primer and fuse division of Willys - Overland Motors to determine whether the fuse is "arming" at the proper moment. Since installation of this machine, inspection approvals of the intricate precision fuses are running as high as 97 percent

British Machine Tool Production Declines; Plan Surplus Disposal

BY WILLIAM J. HARGEST

LONDON—Here, within a few hours of the Front, and where flying bombs make life uncertain, one realizes why every thought and every action of Government, industry and the Man in the Street is primarily devoted to fighting and winning the war. There is postwar planning afoot for reconstruction of bombed areas, demobilization of troops, home-steading and employment of demobilized troops, sale and distribution of Government-owned surplus materials and equipment, Empire industrialization, and advancement of education in research and engineering fields. But to date, these plans are highly controversial.

Machine Tool Production

No official estimate of British machine tools, either in numbers or monetary value, is issued by the Government during the war. While experts in the industry have made their own deductions from time to time, and probably arrived close to accuracy, they remain as secretive as the Government. But such secrecy does not prevent trade tendencies from manifesting themselves, and it is obvious from trade reports during the past twelve months that British machine tool manufacturers have not been as hard pressed as in earlier years of the war. Current backlogs indicate a steady output for the remainder of this year, but beyond that, there is a big question mark.

Emphasized Ships and Planes

During the past year, the highest priority has been accorded to aircraft construction and ship building, and all other branches of the war industry, including the machine tool industry, have been subordinated to that priority. All the skilled men that could be withdrawn from factories with lessened war-production loads have been transferred to aircraft factories and shipyards. As a result, some of the smaller machine tool firms have suffered such drastic manpower losses that they have been compelled to abandon their production schedules and keep the pot boiling with subcontracts for machined items. "Taking in other folks' washing," they contemptuously describe it.

Large numbers of the smaller machine tool manufacturers are, in fact, indignant at this movement, and many of them have endeavored to resist the official policy by organizing themselves into a new association, seeking to gain redress by appeals to Parliament. They have made no headway as yet, and are unlikely to divert the march of events. Although still answerable to the Houses of Parliament for all its policies and actions, and although sharply challenged therein from time to time, the Government of Great Britain has a hold on every individual and on every industry during this war, that we, in America, cannot possibly conceive until we encounter it on the spot.

Purchase Certificates Required

In the machine tool industry, the Government has had an effective control over practically every type of machine tool made or received in the country. This is done by compelling every intending buyer to apply first for a certificate of purchase, without which the supplier, whether manufacturer or machine tool dealer, dare not negotiate a sale. This system has placed a most effective brake on ordinary trade channels, thus ensuring that practically every machine tool transaction primarily serves the war-production program.

Postwar Plans Laid

There is one sign that the Government's claims on the industry are easing off: it is the announcement by a few important manufacturers that owing to some relaxation in the Government's realization program, they are now returning to their prewar range of sizes. This is a step toward postwar conditions, about which there is now much speculation. As a result, an optimistic outlook prevails among many machine tool manufacturers. In recent months all the firms contacted by this correspondent on the question of postwar prospects have stated that they have their own program completely scheduled, covering the types of machine tools to be produced and their potential markets.

Eye Continental Contacts

Machine tool dealers who held well-established contracts with European manufacturers before the war are now admittedly summing up prospects of resuming those contracts. One London dealer stated that he had on his desk an inquiry from a British customer seeking a tentative delivery date for a new battery of Swiss automatics after the war. A large proportion of current machine tool inquiries to dealers are primarily for those postwar programs. It is apparent that there will be a promising market for new production machinery of all kinds, because many industries that served peacetime needs have been shut down during the war, and when they again start production, they will want new plants of the highest productive capacity.

Outline Postwar Disposal

A rather sketchily outlined plan for the disposal of surplus stocks following the war has been prepared by the British Government. It is tentative and provisional, and does not deal with the disposal of fixed assets, such as land, buildings and factories, or machine tools. The latter (machine tools) will be considered separately, as will the disposal of aircraft supplies. The plan is developed to the disposal of manufactured stores for civilian uses. It is reported that the disposal of raw materials will be governed by appropriate control, while surplus munitions will be broken up for scrap. Some of the surplus stores will be used for relief of liberated countries, while others will be allocated to the armed services for use on the Japanese battlefront.

The Government proposes to follow three courses in disposing of surplus stocks: 1. The rate of release should be such as to avoid flooding the market and yet satisfy urgent consumer requirements, and relieve pressure on storage and production space; 2. Normal distribution channels should be used; and, 3. Fair and reasonable prices should be obtained for the stocks, and the number of intermediaries should be minimized to prevent profiteering. The report recommends that representatives of industries and trades concerned should be consulted.

Although the plan is sketchy, it is apparently sound. Methods used after the last war for the distribution of surplus stocks have been studied, and the present plan obviously intends to avoid a repetition of 1919 conditions.

WATCH AMERICAN EXPERIMENTS

LONDON—Tool and production engineers in Britain are following with close attention American experiments with carbide-tipped milling cutters having negative rakes, and there is implied admiration for the progress so far achieved. The vast number of American machine tools installed in British factories during the war has accentuated technical interest in all American production processes. British engineers and factory managers are highly complimentary of American machine tools because of excellent performance under 24-hour operating schedules.

Some months ago, American experiments in quality control received wide attention here, and Government technical publications advised its adoption wherever possible.

Wartime Washington

See War Agency Liquidations

WPB eruptions and casualties are not over. The reconversion squabble which resulted in Charles E. Wilson's resignation and Donald Nelson's China trip, left the newly appointed "temporary" or permanent chairman of the War Production Board, J. A. Krug, in a rather uncertain situation. President Roosevelt did not seem to be too sure about Krug's status, congressmen were divided over the whole thing, and rumors sprang up that Krug was to supervise the "liquidation" of the War Production Board. Whether or not the War Production Board's liquidation was actually under way, signs are mounting that liquidation of many government agencies is in the offing.

Acting WPB Head

J. A. ("Cap") Krug

The War Production Board's Redistribution Division, which had been left in the air by the establishment of the Surplus War Property Administration, was in formal process of liquidation. About 100 of its men, experienced in getting rid of surpluses, had already been shifted to other government agencies taking over the surplus disposal job. Colonel Charles R. Baxter, the Director of the Division, had recommended its liquidation, and his wishes had been approved.

State May Absorb FEA

Meanwhile, unusually reliable sources predicted that the Foreign Economic Administration would be incorporated into the State Department. In the past FEA and State had been frequently reported to be at loggerheads. Now, FEA men stationed abroad are beginning to return to the U. S.

It was also reported that Maury Maverick's Smaller War Plants Corporation was in process of reorganization, while the Office of Civilian Requirements, frequently regarded as overstaffed, is preparing to cut its personnel sizably. It is denied that Dr. William Y. Elliott, Director of the Office of Civilian Requirements will resign. Two other resignations which appear in the offing are those of Director Norman W. Foy, Director of the Steel Division, and John H. Middlekamp, Director of the Automotive Division. These two latter resignations would have nothing to do with Krug's reported "shake-up" of the WPB. Mr. Foy may return to Republic Steel with his job being taken over by his able assistant, William B. Todd, while Mr. Middlekamp, whose health has not been very good, may turn his work over to another competent man, Frederick S. Glover.

Some observers regard as significant the fact that the wartime record of several WPB agencies is in process of preparation. Records are being written of the Copper Division and the Steel Division, and it is argued that this work presages the early end of such government agencies.

Reconversion in Controls

However, it should be stressed that possible liquidation or curtailment of WPB's controls do not spell the end of government regulation. On the contrary, it is believed that such action would precede the setting up of a new "reconversion agency" which will develop new controls to replace the older wartime restrictions.

The shaky status of WPB did not speak too well for reconversion. However, the Mead Committee promises to take a hand in the reconversion battle. The Committee has asked the Army to supply it with information on military stockpiles abroad. This leaves the Army in the position of being forced to issue figures which could certainly be used against it, or else the military might forego the necessity for the examination of these figures by coming through with plenty of munitions cut-backs. Thus far, the Army has given little signs of making substantial cut-backs.

Still Against Reconversion

It is reported that in almost all instances where programs have been cut back, military authorities invariably insisted that the released manpower and material could be used in other war production. Thus, it still looks as though the line against reconversion will be held by the military. However, it will have to cope with the Mead Committee in this attitude, since the Committee fully realizes that some 4,000,000 workers may face unemployment when Germany is defeated and that present plans would lead to a chaotic bottleneck as manufacturers rushed to secure the various permissions required to enter civilian production.

Military authorities have programmed what the plane output will be at the end of the German war, but such plans have already been changed three times. The current postwar plan is called WX-4. Meanwhile, new cuts in the plane program are being readied. It is reported that our reserve of *Liberator* planes represents about half the number used in combat.

BATCHELLER DECLINES

WASHINGTON—Mr. Hiland G. Batcheller, former head of the Steel Division, is reported to have been offered the job as Mr. Krug's right-hand man, and to have turned it down.

Economize on Demobilization

Congress seems to have successfully fought off attempts to inject costly methods of increasing the national debt into the demobilization bill. As the bill may be passed, it will leave unemployment benefits in the hands of the states with a government guarantee of such payments. Attempts to pay transportation for millions of migrated war workers, or to increase unemployment benefits to as high as $35 a week for over a year and a half were badly beaten despite strong union sponsorship.

The surplus property disposal bill may come out of congress with some compromise between House and Senate differences over whether the Administration of the Board should be left in the hands of one man or in the hands of an eight-man board. Chances are the measure will provide for a strong control by the advisory board if one-man administration is finally decided on.

Would Synchronize Reconversion

Morris Copeland, assistant head of the WPB Statistics Division, has left Washington with one of his assistants to go to England, where they will work with the British on some basis to synchronize the reconversion of Great Britain with the United States on a prewar parity basis. This is reported to have arisen out of some differences in the Combined Production and Resources Board as to where and how planned cut-backs of munitions should be made. Just how successful attempts at "synchronization" will work out, remains to be seen.

Manpower Flows from West Coast Plants, Fearing War-End Layoffs

LOS ANGELES—Hundreds of applications have been filed by West Coast manufacturers since August 15 under the new "spot" reconversion program, so many, in fact, that local WPB offices ran out of blank forms. Shrinkage of aircraft sub-contracting is preventing many smaller concerns from occupying themselves fully with war work, and they are hastening to get permission to commence or expand civilian production. However, manpower restrictions are expected to prevent approval of many of the applications.

Biggest of the manpower problems appears to be that of retaining workers. Re-migration is becoming appreciable, and workers continue to "disappear" from war plants, aircraft plants especially. Additional measures are expected to be taken, soon, to get workers to "finish the job."

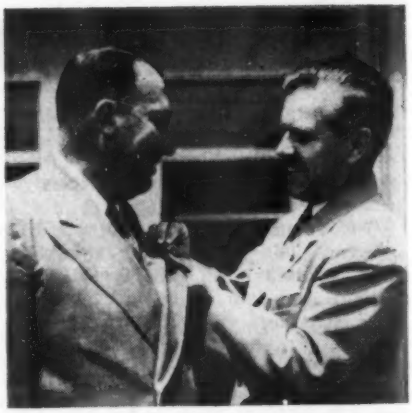
Assure Workers of Future

Consolidated Vultee Aircraft Corporation recently issued a carefully worded statement to its employees, the gist of it being that employees with good records will be given all possible consideration for postwar employment. Northrop Aircraft, still recruiting workers for its P-61 program, has made somewhat similar statements.

Availing itself of the high manpower priority given to its program for the production of B-29 bombers, Boeing Aircraft is recruiting workers in California, much of which is designated as No. 1 labor shortage area. There is an implied promise of longer-continued employment in the production of the Super-Fortresses, and Boeing offers to pay workers' fare to Seattle and assist in finding housing.

Rubber Has Top Priority

Top manpower priority in Southern California has been given to the rubber companies, and a vigorous drive to recruit workers for the production of tires is being staged. Good prospects for postwar employment in the local tire companies is stressed.



Quarter Century—C. H. Reynolds, left, vice president, Sheffield Corporation, receives a 25-year service pin from Louis Polk, company president

Shortages Ease Rolling Stock Orders

CHICAGO—Looking to the day of peace, several railroads have indicated their interest in new equipment. The New York Central Railroad plans purchase of $21,067,000 in cars and locomotives; Chicago & Northwestern Railway Co. plans to spend $6,914,000 for 2,000 box cars; Baltimore and Ohio has made an inquiry involving 17,000 freight cars; Chicago and Alton railroad is inquiring for 1,500 cars. The Chicago, Milwaukee, St. Paul, and Pacific Railway has under consideration "very large" expenditures for improvement of equipment and service.

Probably taking into account the manpower and material shortages, railroads haven't ordered freight cars as heavily as expected, and the total number of domestic freight cars made this year will run about 40,000 instead of the predicted 60,000. About 39,000 cars have been completed for the U. S. Army this year, however, and the U. S. Army Transportation Corp. recently placed a 1945 order for about 25,000 freight cars.

Some postwar plans were revealed by Fairbanks, Morse & Co., when it recently delivered to the Milwaukee road a 120-ton, 1,000 hp. diesel electric switching locomotive. The switcher, made at the Beloit, Wis., Works, is the forerunner of a complete line of freight, passenger, and dual-purpose locomotives—a new field for Fairbanks, Morse. Building of this first locomotive was made possible by the Navy granting permission to divert the diesel engine from the submarine program.

Thompson Workers Vote Out CIO, AFL; War News Cuts Heavy Scrap Demand

CLEVELAND—Frederick C. Crawford, director and former president of the National Association of Manufacturers, won another round in a seven-year contest with unionism last week when workers in his Thompson Products Co. and Thompson Aircraft Products Co. repudiated the CIO and the AFL by a vote of more than 3 to 1.

Cleveland's largest employer, with 16,000 workers in the two plants, Mr. Crawford has been one of the nation's outstanding advocates of labor-management relations without the intervention of unions.

The NLRB order for the elections last month also ordered the disestablishment of independent unions in the two plants, an order which the company has promised to contest in the courts. Union leaders took particular exception to addresses of Mr. Crawford to company mass meetings in which he asked: "What do you want? Progress together, or a petty brawl every week."

Scrap Surplus Mounts

Scrap dealers report that heavy melting steel scrap is piling up in their yards under cautious buying and a reduction in the inventories of steel mills watching the war news.

Shell turnings, of which there is an ample supply, is finding few takers at prices $4 to $5 under ceilings.

Steel companies here have received an appeal from WPB's Steel Division asking them to stop reducing scrap inventories. WPB warned that this was lowering employment in scrap yards, so that any military reversal might leave the steel industry in a bad way on scrap supplies.

German Production Efficiency Declines Despite Efforts

LONDON—Reports published in the German press indicate a gradual loss in production efficiency, which is only partly compensated by longer working hours, simplification of production processes, and the employment of more workers. A long-term study of working hours in one factory revealed that effective man-hours lost through illness, bad use of time, and poor work has increased 14 percent, irrespective of the fact that the work week has been increased to 60 hours in some cases and 72 hours in others, as against 40 hours per week during peacetime. The 14 percent increase is broken down as follows: 7 percent due to illness, 5 percent to poor work and 2 percent to improper use of production time. The study was made to prove that in this particular factory a production increase of 25 percent could be achieved by increasing working

hours 25 percent; however, actual production increase was only 5 percent. The Germans explained this by stating that in all countries at war there is an increase in faulty production, resulting in rejects; also, inexperience and the use of unskilled help results in slowed production and assembly of equipment. Furthermore, the incentive to do good work is lower because of the absence of competition among manufacturers.

Declines Despite Efforts

There is apparently little or no possibility of increasing the number of workers in German factories, and this explains frantic Nazi efforts to study causes of falling efficiency. It is known that the abolition of free markets before the war, rationing, and freezing of wages and profits, produced problems in Germany that have not been solved. It is also known that the German labor front trained 50,000 time study engineers between 1933 and 1943, and that official schedules with uniform working time and working processes were established and made valid in all parts of Germany. Also, that wages are paid according to individual or group efficiency, using base wage schedules drawn up by the time study engineers. Furthermore, Germany worked out a system for mobility of labor, so that most important industrial workers could be switched readily from one part of the country to another. German engineers also concentrated on the use of semi-automatic and automatic machines, as well as the application of uniform standards for machines and their parts, making them wholly interchangeable. There is no doubt that this has been valuable to the Nazis with their extreme dispersal of factories; nevertheless, an undercurrent in German press reports indicates that there is a steady and definite decline in production of vital war material and equipment.

Lack Materials to Raise Efficiency

It is reported that hot meals are provided by work canteens and these have a beneficial effect; however, it is apparent that factors which tend to lessen workers' fatigue and increase efficiency, including better lighting and properly designed working facilities, have been given secondary consideration, because neither the materials nor labor are available to produce them. Obviously, technical initiative is placed in the hands of a small number of scientists and engineers with the workers themselves becoming automatons.

It is probable that the loss of production efficiency can be placed, as in so many other instances, to German inability to understand and capitalize on psychological reaction of workers themselves, and, in spite of vaunted technical ability, the output from Nazi factories goes down and down.

Names in the News

Leonard S. Hobbs

John Haley
Wright A. Parkins

Leonard S. Hobbs was elected vice president for engineering of United Aircraft Corp., East Hartford, Conn., while **Wright A. Parkins** has been appointed engineering manager, Pratt & Whitney Aircraft Div. Both men have been with United Aircraft for over 15 years and in 1935 Mr. Hobbs was named engineering manager of Pratt & Whitney Aircraft and was elected a director of United Aircraft Corp. in 1942. Mr. Parkins was appointed assistant chief engineer in 1938.

George H. Hufford

Three new vice presidents have been appointed at the Weatherhead Co., Cleveland, Ohio. Those appointed are: **George H. Hufferd,** vice president in charge of engineering; **H. Church,** vice president in charge of sales; and **Robert P. Gibson,** vice president in charge of automotive sales. At the same time, **Morris H. Wright** was named assistant to the president.

Donald B. MacAfee has been made vice president in charge of sales for the Benchmaster Manufacturing Co., Los Angeles, Calif. Mr. MacAfee was formerly president of Mechanical Supplies, Inc., Manila, P.I., assistant to the president of Nevada Scheelite, Inc., and vice president and general manager of Quicksilver, Inc.

John W. Scallan has been elected vice president of the Pullman-Standard Car Manufacturing Co. Mr. Scallan, who has been with Pullman-Standard for 18 years, will be in charge of sales of transportation equipment and war material in Chicago and the middle west.

William H. Kramer, Jr. has been appointed production manager of the Stover Lock Nut and Machinery Corp. with headquarters at their Easton, Pa., plant. Mr. Kramer has been with the compressor division of Ingersoll Rand Co. for the past ten years.

E. D. Almy, formerly assistant general manager of Joshua Hendy Iron Works, Sunnyvale, Calif., has been named manager of the company's Crocker-Wheeler Div. in Ampere, N. J., to succeed A. J. M. Baker, whose resignation becomes effective Sept. 30.

Capt. Almy will be succeeded by **Harry C. Gunetti,** general superintendent for three years of the Sunnyvale plant, as assistant general manager.

E. D. Almy

H. C. Gunetti

Harry R. Gillett has been elected executive vice president of the Harvill Corp. at a recent meeting of the board of directors.

Walter F. Siegmund has been appointed general sales manager for the Olin Corp., East Alton, Ill. Col. Siegmund, who recently retired from active duty after 30 years in the Army, will coordinate and direct the sales of various of the Olin Corp. affiliates including The Western Cartridge Co. and its Winchester Repeating Arms Co. Div.

B. R. Newcomb

Benjamin R. Newcomb has been elected president and general manager of the John Waldron Corp., New Brunswick, N. J. Until recently, Mr. Newcomb was president of the Auditorium Air Conditioning Corp., New York, of which he remains a director. He was formerly chief engineer of the American Optical Co. and, for ten years, headed the patent department of the Babcock & Wilcox Co., New York.

BUSINESS ITEMS

Curtiss-Wright Corp. has purchased the **L.G.S. Spring Clutches, Inc.**, which will hereafter be known as the **L.G.S. Spring Clutches Corp.**, with **E. F. Theis,** manager of the Indianapolis plant of Curtiss-Wright Corp., propeller division, as president.

The American Standards Association recently moved its office from 29 West 39 St., New York to larger quarters at Grand Central Terminal Office Bldg., 70 East 45 St., New York 17, N. Y.

Acme Pattern & Tool Co., Dayton, Ohio, has changed its corporate name to **Acme Aluminum Alloys, Inc.** Their production of patterns, tools and dies and the work of its engineering department will continue unchanged as the Acme Pattern and Tool Div. of the company.

The Square D Co. has opened a new manufacturing plant and warehouse located at 2310 Ranier Ave., Seattle 44, Wash., with **Walter H. Bodle** as manager.

Demco Tool Service, Inc., 5236 San Fernando Rd., Glendale, Calif. has been organized by a group of Detroit machine tool and cutting tool manufacturers—**Michigan Tool Co., Colonial Broach Co., Detroit Tap & Tool Co., Tungsten Carbide Tool Co., Colonial Bushings, Inc.**, and **New Methods Steel Stamps, Inc.** of Detroit and **Genesee Tool Co.** of Fenton, Mich.—to provide field engineering service for the assistance of Southern California industry.

The Ransome Machinery Co., subsidiary of Worthington Pump & Machinery Corp., Dunellen, N. J. has appointed the following organizations as distributors of the Ransome line of welding positioning equipment: The Post Welding Supply Co., Birmingham, Ala.; Hobart Welder Sales & Service, Cleveland, Ohio; W. P. & R. S. Mars Co., Duluth, Minn.; American Machinery & Supply Co.; Omaha, Nebr.; Arcway Equipment Co., Pittsburgh and Philadelphia, Pa., Baltimore, Md. and Syracuse, N. Y.; Hobart Sales Service Supplies, Buffalo and Syracuse, N. Y.; Peoria Welding Supply Co., Peoria, Ill.; Big Three Welding Equipment Co., San Antonio, Corpus Christi, Dallas, Houston and Fort Worth, Texas; Moline Welding Service, Moline, Ill.; Chicago Welding Sales Co., Chicago, Ill.; Victor Equipment Co., San Francisco, Fresco, Los Angeles, and San Diego, Calif.; Austin-Hastings Co., Inc., Cambridge and Worcester, Mass. and Hartford, Conn.; J. E. Raney and Co., Boston, Mass.; Welding Engineering and Sales Co., New York, Buffalo and Syracuse, N. Y.

Quaker Chemical Products Corp., Conshohocken, Pa. has selected the trade name **Microcut** for its line of soluble cutting oil bases formerly known as Tool Kool.

The Hydraulic Press Manufacturing Co., Mt. Gilead, Ohio has established a new regional and branch sales headquarters at 500 Fifth Ave., New York, with **Mills N. Ripley** in charge as sales manager of the North Atlantic region and **D. L. Cleveland** as manager of the New York branch office.

Moore Machinery Co., 3878 Santa Fe Ave., Los Angeles 11, Calif., has been appointed exclusive representative for the complete line of Reed-Prentice high pressure die casting machines and their improved type of plastic injection molding machines in the Los Angeles territory.

The Phillips Mine and Mill Supply Co., Pittsburgh, Pa. have been appointed district sales representatives for the **Hyster Lift Truck Co.** of Portland, Ore. and Peoria, Ill.

OBITUARIES

W. R. Winter

William R. Winter, 68, vice president of Potter & Johnston Co., Pawtucket, R. I. died suddenly Aug. 10 in New York. Mr. Winter had been associated with the company continuously since 1902, four years after it was founded. He spent 35 years abroad directing foreign sales until 1937 when he returned to the home office to take charge of the foreign sales from there.

Edward A. Long, one of the oldest machine tool distributors in Boston, died Aug. 24 after an illness of several months at the age of 63. Mr. Long started work with Hill, Clarke & Co. in 1900 and later he was sales manager for Whitcomb-Blaisdell Machine Tool Co., Worcester, Mass., and Factory & Mill Supply Co., Boston. For the past ten years he was in business under the name of Long Machinery Co.

John C. Dilworth, sales manager of the Railroad Materials and Commercial Forgings Div., Carnegie-Illinois Steel Co., passed away Aug. 23 at his home in Pittsburgh.

Frank E. Hulett, president of the Hulett Engineering Co., Cleveland, Ohio, passed away recently at the age of 68. He was well known for his invention of an unloading device for ship cargo and several other labor-saving machines.

John J. McCarthy passed away at Newbury, Mass. on August 13. Mr. McCarthy, a research engineer and inventor, held many patents in the field of internal combustion Diesel engines.

MEETINGS

American Gear Manufacturers Association. Semi-annual meeting. Edgewater Beach Hotel. Chicago, Ill. Oct. 30-Nov. 1.

American Machine Tool Distributors' Association. Fall meeting. The Homestead. Hot Springs, Va. Nov. 13-14.

American Society for Metals. Annual meeting. Hotel Statler. Cleveland, Ohio. Oct. 16-20.

American Society of Tool Engineers. Semi-annual meeting. Hotel Syracuse. Syracuse, N. Y. Oct. 12-14.

American Welding Society. Annual meeting. Hotel Cleveland. Cleveland, Ohio. Oct. 16-19.

Association of Electronic Parts and Equipment Manufacturers. Electronic Parts and Equipment Industry Conference. Stevens Hotel. Chicago, Ill. Oct. 19-21.

National Electronic Conference. Medinah Club of Chicago. Chicago, Ill. Oct. 5-7.

National Metal Congress. National Metal Exposition. Public Auditorium. Cleveland, Ohio. Oct. 16-20.

National Safety Council. National Safety Congress. Sherman & LaSalle Hotels. Chicago, Ill: Oct. 3-5.

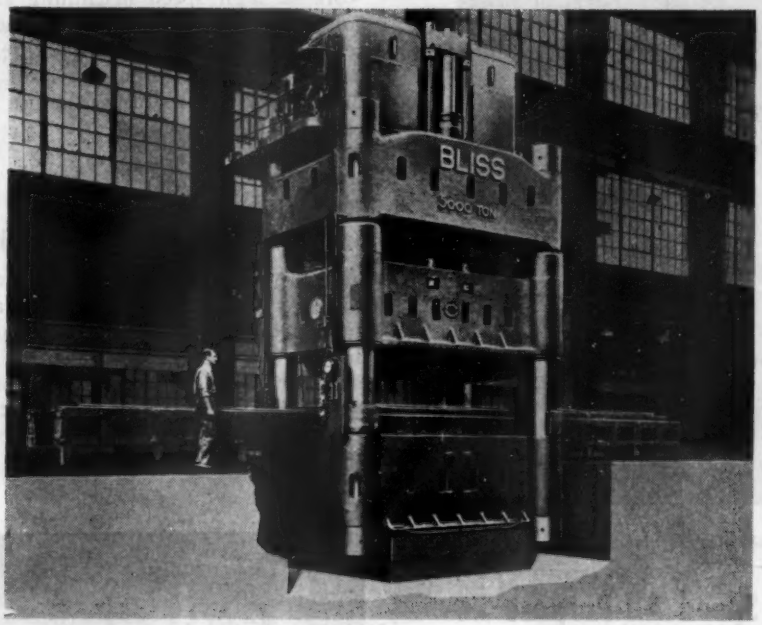
National Tool & Die Manufacturers' Association. Statler Hotel. Buffalo, N. Y. Sept. 21-23.

Society of Automotive Engineers. National Aircraft Engineering and Production Meeting. Hotel Biltmore. Los Angeles, Calif. Oct. 5-7.

Society of Automotive Engineers. National Tractor Meeting. Schroeder Hotel. Milwaukee, Wis. Sept. 13-14.

Society of the Plastic Industry. Fall meeting. Waldorf-Astoria Hotel. New York. Nov. 13-14.

Shop Equipment News



Bliss 5,000 ton two-die slide hydraulic press

E. W. Bliss 5,000-Ton Two-Die Slide Hydraulic Press Includes Rubber Dies and Material Handling Devices

A 5,000 ton two-die slide hydraulic press, designed and built by the E. W. Bliss Company, 53 St. and Second Ave., Brooklyn 32, New York, incorporates the use of the rubber die process, adapted to the diversified production of the aircraft industry, with modern material handling devices of the four-and six-die slide presses.

Outstanding among the features of this press is the automatic cycle which causes the die slide to move into its position in 4½ seconds. The stroke of the die slide is 168 1/16 in. As soon as the die slide is in position, the press completes a pressing cycle with pressure independently adjustable for each die slide. At the completion of the press cycle, the die slide automatically moves out into unloading and loading position.

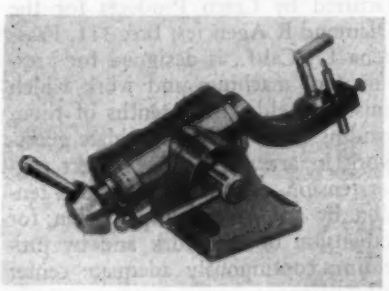
Other features include: Bliss universal electric control; interlocked safety sequence operation; no master operator required; speedy die slide movement; independent pressure control on each die slide; provision for addition of third and fourth slide; shockless electric drive of die slides; accurate positioning and fitting of die slide to rubber pad and twin hydraulic pumping units and circuits.

A few of the more important specifications are: pad size, 50 × 144 × 12 in.; max. stroke, 40 in.; floor space overall, 550 × 170 in.; height overall, 30½ ft.; height from floor, 26 ft.

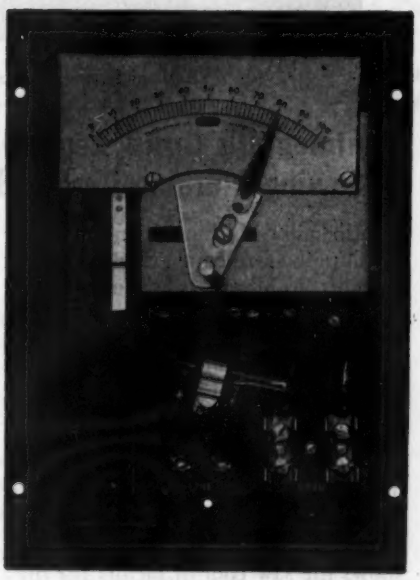
U. S. Tool Angle Correcting Radius Dresser is Available

U. S. Tool and Mfg. Co., 6906 Kingsley, Dearborn, Mich., has applied for patent on a new precision angle correcting radius dress, No. T-124, described as doing the work of a radius dresser as well as dressing the corrected radius on a wheel for grinding compound and compound-complex forms on flat forms tools.

This dual-purpose tool employs the direct reading principle. It is said to be light in weight, yet sturdy in construction to guarantee smooth and precise radii, while both angle scales are easy to read and readily accessible. All exposed unpainted parts are chrome painted to insure against stain and rust. It is fitted with Timken taper roller bearings and a one piece hardened steel spindle.



U. S. Tool angle correcting radius dresser



Wheelco Rheotrol

Wheelco Rheotrol Provides Stepless Current Control

Rheotrol, a manually operated controller for regulating input to electrically operated furnaces, ovens, heaters and kilns, available from Wheelco Instruments Company, Chicago 7, Ill., has been refined and is now offered in a flush-mounted case.

The instrument provides stepless, wasteless control of current supply. It replaces the standard rheostat and, by elimmating the current waste through resistors, provides improved operating efficiency. It places any temperature in the equipment's range at the command of the operator.

DoAll high speed all-purpose sawing machine

Continental's DoAll Zephyr High Speed All-Purpose Sawing Machine Designed for Precision and Versatility

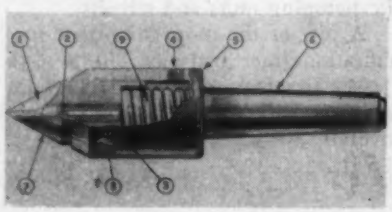
Continental Machines, Inc., 1301 Washington Avenue South, Minneapolis 4, Minn., is manufacturing a new high speed sawing machine, the DoAll Zephyr, especially adapted for versatile sawing conditions.

The DoAll Zephyr features a 36 in. throat depth and 20 in. work thickness capacity with speed ranges of from 1,500 to 10,000 ft. per min. This speed range is infinitely controlled by a "Speedmaster" variable speed pulley. A job selector dial shows the saw control factors for the shaping of 104 basic materials. This dial and the controlled infinite variable speeds shown by a tachometer speed indicator combine to give the operator correct sawing techniques for shaping all materials.

Automotive hydraulic brakes on upper and lower wheels and housing of all moving parts behind walls of steel, protect the operator at the point of work.

Standard equipment includes a 10 hp. variable speed drive, a 30 in. × 30 in. work table with a secondary table extension 17 in. × 20 in. The machine has a four-way table tilt, 45 deg. to the right, 10 deg. to the left, front and rear. An adjustable table lamp illumines the point of work. Pipe flange arrangements are provided for exhaust removal of chips. The upper wheel is spring tension mounted.

Three high speed saw guides are adjustable for all ¼ in. to 1½ in. wide saw bands.



New Era lathe center

Diamond R Agencies Has New Era Lathe Center Available

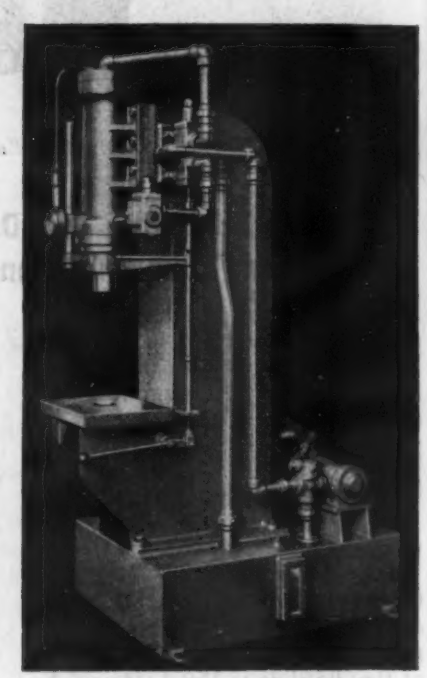
The New Era Lathe Center, manufactured by Cesco Products for the Diamond R Agencies, Box 311, Pasadena 17, Calif., is designed for pressure tool machines and work which must be held within tenths of thousandths. It is said to eliminate guesswork in arriving at the correct center tension, and to maintain this tension by automatic compensation for expansion of the work and by providing continuously adequate center lubrication.

The only movement in the center is the slight and gradual one-way longitudinal movement of the point induced by expansion of the work. The only friction is at the point and continuous lubrication there insures long life for the point, which is replaceable.

Center holes are not burned in the work in high speed machining and complete lack of wobble insures perfect concentricity in high speed thread cutting. The lathe center is said to be especially applicable to the use of carbide cutting tools.

Beatty Gap Type Hydraulic Press of 15-Ton Capacity

A 15-ton gap type hydraulic press made by Beatty Machine & Manufacturing Company, Hammond, Ind., has found use in general machine shops, railroad car shops and repair shops for straightening and for the removal and insertion of bronze bushings and other bearings.



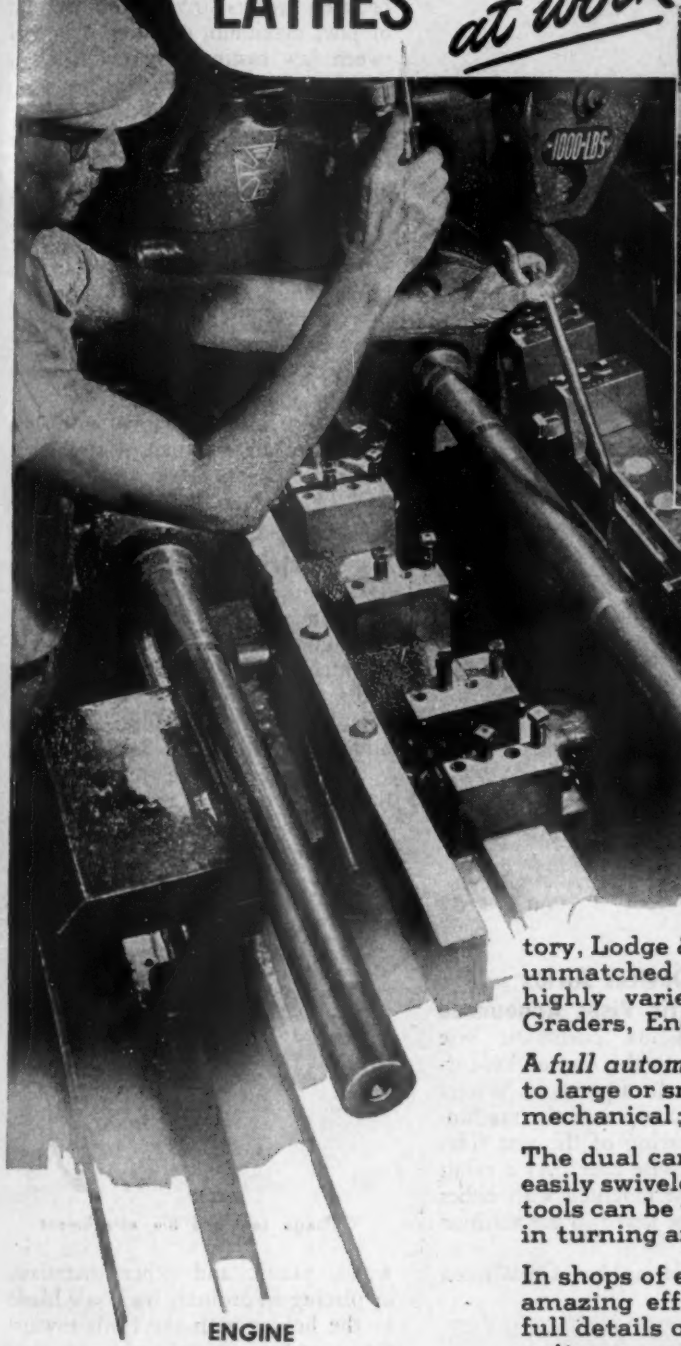
Beatty hydraulic press

Specifications are: maximum capacity, 15 tons; stroke 15 in.; advance and pressing speed, 208 in. per min.; return speed, 432 in. per min.; daylight or maximum opening, 20 in.; minimum die space, 5 in.; gap, 9½ in; table size, right to left, 20 in., front to back, 16 in.

The table is provided with a 4 in. dia. clearance hole for the insertion or removal of press parts, broaching or bushing tools.

LODGE & SHIPLEY LATHES *at work*

turning Cylinder Liners, Sprocket Shafts, Track Roller Hubs, Transmission Shafts, Gear Blanks and Shafts.



AT CATERPILLAR TRACTOR CO.

Throughout "Caterpillar's" giant factory, Lodge & Shipley Duomatic Lathes demonstrate their unmatched versatility, turning endless quantities of highly varied components for Diesel Tractors, Motor Graders, Engines and Electric Sets.

A *full automatic* lathe, the Duomatic is equally adaptable to large or small lots. Movements and set-ups are entirely mechanical; no cams are required to change cycles.

The dual carriages and tool slides -- front and rear -- are easily swiveled to cut from any angle. As a result, multiple tools can be used to far greater advantage than ever before in turning and in straight and angular facing operations.

In shops of every type, Duomatics continually prove their amazing efficiency. Call Lodge & Shipley Engineers for full details on these cost-cutting, labor-saving lathes. Or write on your company letterhead for Bulletin No. 601, showing standard cycles and other helpful data.

ENGINE
TOOL ROOM
AUTOMATIC
OIL COUNTRY LATHES

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

L & S LATHES

Snyder Two-Spindle Special Purpose Milling Machine For Aircraft Pistons Adapted From Standard Units

Snyder special-purpose miller

A special-purpose milling machine, developed by Snyder Tool & Engineering Company, 3400 E. Lafayette Ave., Detroit 7, Mich., is used in milling a rectangular pocket inside the dome of an aircraft piston and removing stock from the inside faces of the wristpin bosses. The machine is an adaptation of a Snyder standard piston milling machine and includes the standard base, column, hydraulic unit and coolant tank assembly.

The 2-spindle milling head has fixed center distance requiring cutters of identical diameter. Each spindle is mounted in a quill providing lengthwise adjustment for tool life.

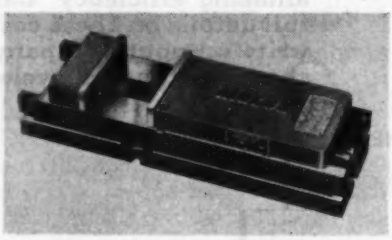
The machine takes two parts, performing identical operations on both, and carrying them automatically through the complete cycle, locating the piston, cutting to correct depth; cutting the pocket and wristpin boss, unil it reaches the stop position where the cutters cease rotating.

The standard units on this machine were developed originally for cutting fins and clearances and used a rotary fixture.

Production Devices Airlox Pneumatic Vises Announced

Two new Airlox pneumatic vise models added to the line of Production Devices Incorporated, Whitehall, N. Y., incorporate the machining and keywaying of the vise sides as well as the vise base. As a result the vise can be mounted with either side or the base keyed to the machine table.

The movable jaw has a maximum



Airlox pneumatic vise

travel of ½ in. which, if necessary, can be adjusted down to ⅛ in. for safety reasons.

Specifications of senior model S-30: length overall, 18 in.; width overall, 6⅛ in.; height overall, 4⅛ in.; weight, approx., 70 lb.; jaw width, 6 in.; jaw depth, 1¼ in.; jaw face screws, ½ in.-13, spaced 3.818 in. between centers, 0.567 from bottom of jaw; maximum opening, 5 in. between jaw castings; air cylinder capacity 0.01 cu. ft.; gripping force on work is air pressure times 50.

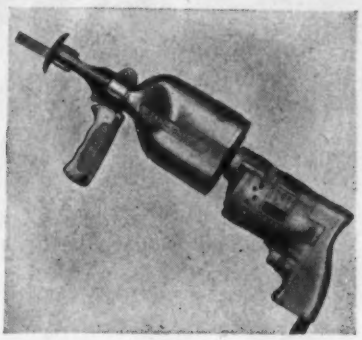
Specifications of senior model S-50: length overall, 24 in.; width overall, 7¼ in.; height overall, 5¼ in.; weight, approx., 110 lb.; jaw width, 7 in.; jaw depth, 1½ in.; jaw face screws ½ in.-13 spaced 3.990 in. between centers, 13/16 in. from bottom of jaw; maximum jaw opening, 8 in. between jaw castings; air cylinder capacity, 0.02 cu. ft.; gripping force on work is air pressure times 70.

Higher gripping ratios with less jaw travel are optional at slight additional cost.

Saw-Chief Attachment Converts Electric Drill to Saw or File

The Chicago Precision Equipment Company, 919 N. Michigan Ave., Chicago 11, Ill., announces a new attachment for ¼ in. chucked electric drills that is said to provide a portable power saw and file. It is sold under the trade name Saw-Chief.

According to the manufacturer, the new device will rapidly saw into every kind of metal, casting or rod,



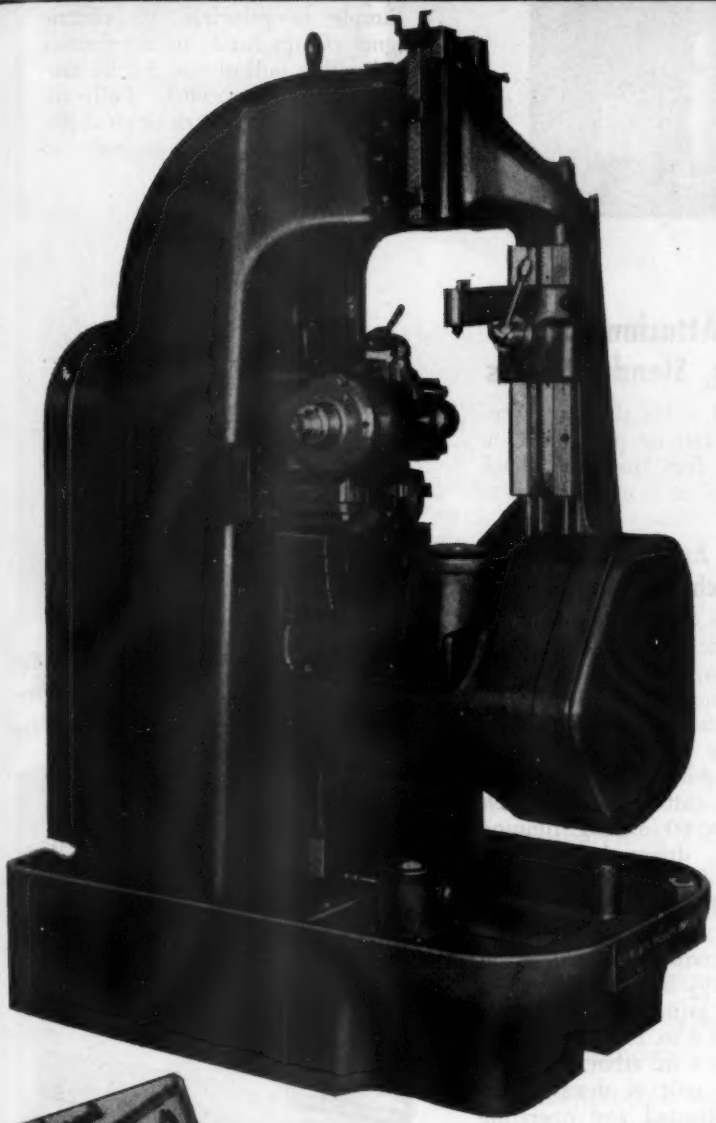
Chicago saw and file attachment

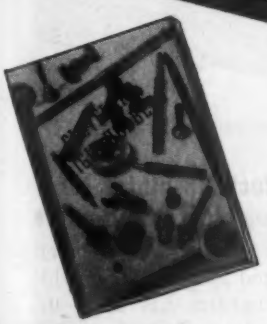
wood, plastic and other materials, by placing an ordinary hack-saw blade in the holder with the teeth toward the operator. It may also be converted into an automatic file by simply inserting a file in the same chuck or holder. Moreover, where electric power is not available, it is claimed that the unit can be efficiently propelled by simply attaching it to the compressed airline or flexible shaft.

The inner mechanism of the Saw-Chief is of balanced ball bearing construction, built for heavy-duty cutting and to withstand hard use. The pistol grip handle permits the operator to guide and hold the device with ease.

Can I do climb hobbing on a

RIGIDHOBBER?





This bulletin tells all about Rigidhobbers—what they are — how made—and how they can help you reduce costs.

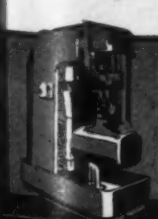
Yes!...

but that's not all — the hob can be made to run in either direction thus the sequence of operation may be from top to bottom or bottom to top as you desire. This is accomplished with transfer switches which make the machine readily adaptable to climb hobbing and regular hobbing operations.

Every possible operating convenience is included in Rigidhobber design and construction. Limit switches control length of travel and distance of rapid traverse and a safety overtravel switch is provided in case machine is operated beyond its capacity. One run button controls the machine. The main control is in the upper rear column protected from dirt and coolant.

The simplicity of operation—the rigidity of design and construction — enables operator to become expert in a short time.

Thus the Rigidhobber offers a practical, high production method for the accurate duplication of spur and helical gears —straight and helical splines.

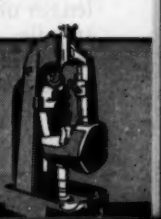


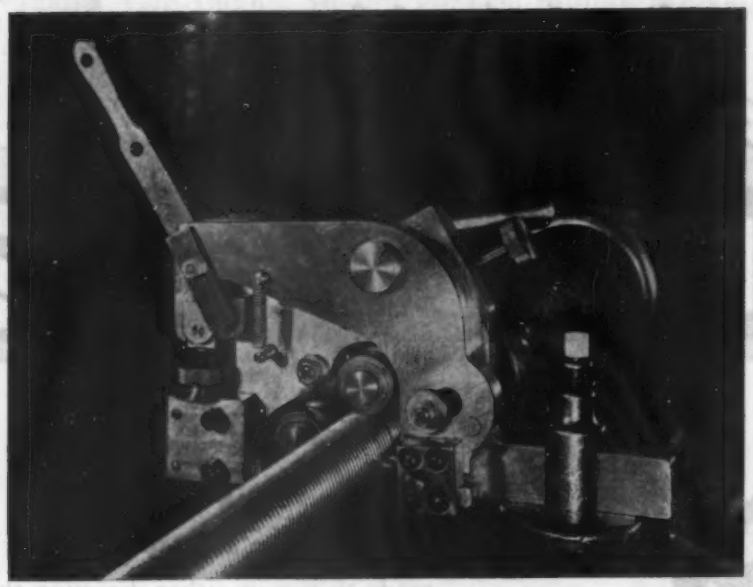
The CLEVELAND HOBBING MACHINE *Company*

General Offices:
1311 CHARDON ROAD
CLEVELAND 17, OHIO

Chicago Office:
624 S. MICHIGAN AVE.
CHICAGO 5, ILLINOIS

BUILDERS OF RIGIDHOBBERS AND RIGIDTURNERS





Blank & Buxton Micro-Turnthread

Blank & Buxton Micro-Turnthread Lathe Attachment Aids in Turning and Threading Long, Slender Shafts

Blank & Buxton Machinery Co., 3100 E. Michigan Ave., Jackson, Mich., has developed the Micro-Turnthread lathe attachment, designed to overcome the difficulty encountered in turning or threading long, small diameter shafts.

The device is a combination tool holder and follow rest, installed in the lathe toolpost. Embodied in the toolholder are rollers with screw adjustment for variation in work diameter. Micrometer adjustment of the cutting tool itself is provided, as well as a quick retractability feature for moving the tool in and out at beginning and end of threading cuts. Retraction is effected by means of a toggle.

The attachment is available for right or left hand turning. While intended primarily for turning and threading, it is also suitable for light forming and cutoff operations. The follower rolls are adjustable for diameters from ½ to 2 in. The cutoff capacity is 1¾ in. solid. Tools used in this model are ground from ⅜ in. square toolbits.

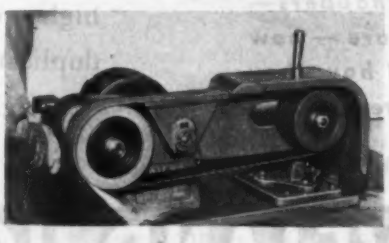
The right hand attachment has the tool following the rolls and is used on finished shafts. The tool precedes the rolls on the left hand model. It can be used on hex, square or rough forged shafts. The rolls run on the finished cut, insuring the same diameter finished cut for the whole length of shaft, regardless of play in spindle, or looseness of saddle or cross-slide. After cut is started, no tailstock is needed because the attachment itself holds the work centrally. Work can be performed on shafts several feet from the chuck without any tailstock support.

Porter-Cable Announces New Model Bench Type Belt Grinder

As an addition to their line of abrasive belt grinders, Porter-Cable Machine Company, Syracuse 8, N. Y., announces its new model BBS bench type belt grinder. This unit can be used for many grinding operations.

This new grinder unit uses an endless metal cutting abrasive belt 2½ in. wide × 60 in. long, running 4,500 s.f.p.m., driven by a 1 hp. motor. The design of this bench grinder provides a flat bed grinding area 2½ in. × 8 in. as well as a soft resilient contact wheel 7 in. in diameter × 2½ in. wide, which is adaptable for grinding all types of metal. Wheels 6 in. to 8 in. dia. can be used on the 1 in. arbor.

The whole unit is described as ruggedly constructed and operating free of vibration. The machine can be furnished with or without motor.

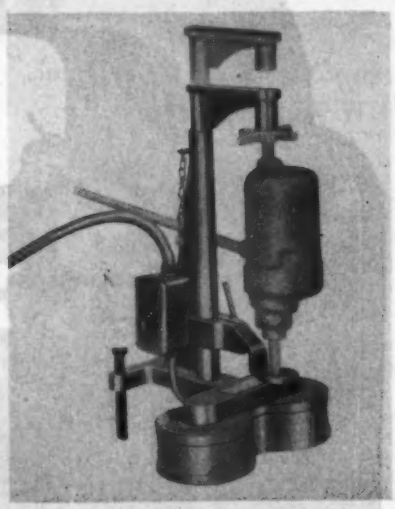


Porter-Cable belt grinder

Mereco Drill Post Operates From Welding or AC Circuit

A 39-lb. drill post, designed to operate from a regular welding circuit or which can be used on 110-120 a.c. circuit by use of a rectifier, is being manufactured by the Mechanical Research Co. of Oregon, Ltd., 601 Failing Bldg., Portland 4, Ore. It is claimed that this Mereco portable magnetic drill post can cut a job from 70 to 5 manhours, and thus practically pay for itself in one day's time.

Simple in principle, its electric magnet clamps firmly to any ferrous metal with a pull of 800 lbs. by simply turning on the switch. Fully adjustable for either electric or air drills, it drills from ¾ to 1 in. holes in



Mereco portable magnetic drill post

any position—overhead, vertical, flat—and is adjustable for uneven spots. It can also be used for reaming, tapping and spot facing.

The manufacturers are producing three models of varying sizes for use in different types of construction work.

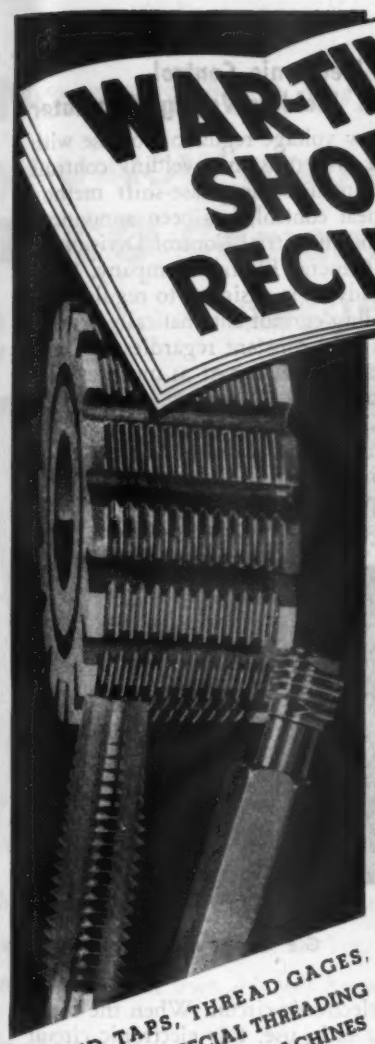
Jackson arc-welding insulator

Jackson Products Insulator for Arc Welding Electrode Holders

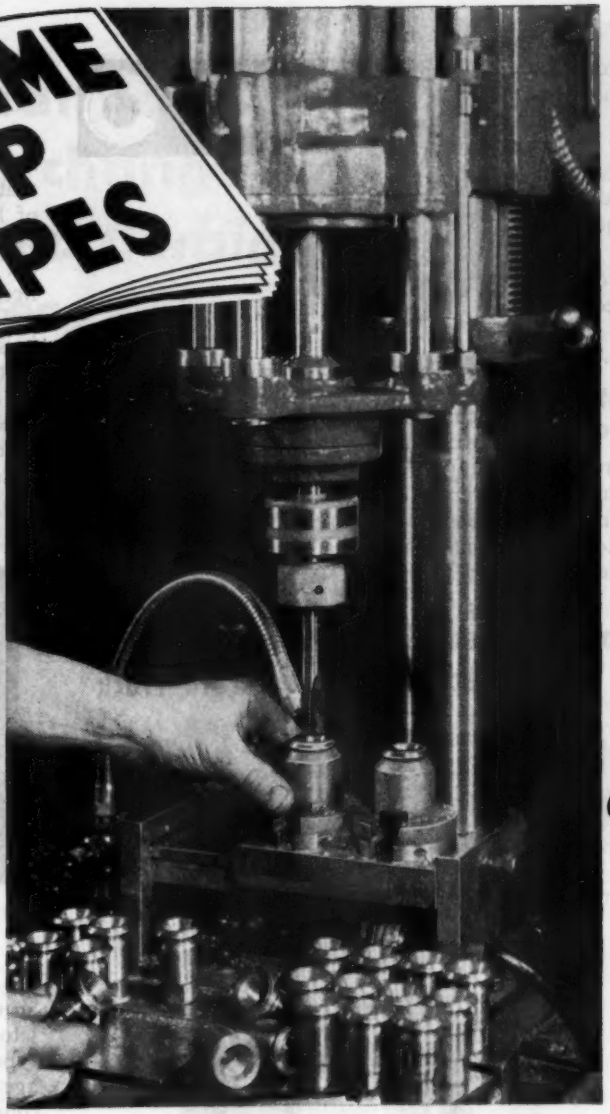
A new type of insulator to be used on their insulated tong-type arc welding electrode holders has been announced by Jackson Products, 3265 Wight St., Detroit 7, Mich.

For this insulator the manufacturer claims four definite advantages: 1.

WAR-TIME SHOP RECIPES



GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES



Continuous Precision Tapping with DETROIT *light duty tapping machine and simple manual fixture*

Tapping 3/4 inch 16 NF threads 1-1/4 inches deep (Class 3 Fit) in a blind hole takes less than 10 secs. per part in continuous production on this "DETROIT" LTM lead screw tapping machine.

Virtually eliminated rejections. Drive to tap is taken off base of lead screw eliminating wind-up effect.

High production rate achieved made additional machines unnecessary to maintain required production.

Other features of the "DETROIT" Light Duty Tapping Machines include:

Adjustable tapping head.
Full length triple tap-spindle guides.
Three selective spindle speeds.
Multiple disc friction clutch reduces tap breakage.
Lead screw is hardened and ground. Two-piece bronze nut. Completely enclosed. Quickly interchangeable.

For complete information ask for Bulletin #LTM-44.

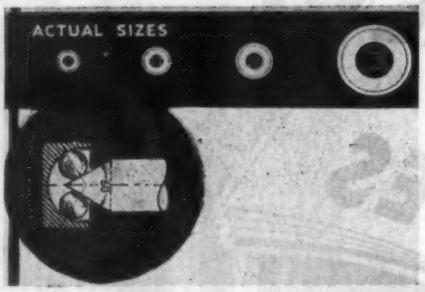
BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U.S.A.

metal-clad jaw covers (insulators) increase holder life, cut maintenance cost; 2. arch construction assures greater strength; 3. rounded surface tends to deflect heat and weld splatter; and, 4. properly placed vents provide for free flow of air and hence there is no trapped heat.

The new insulators are interchangeable with all Jackson insulated tong-type holders now in service.



Miniature Precision pivot ball bearings

Miniature Precision's Pivot Type Ball Bearings Available

Pivot type ball bearings are now available from Miniature Precision Bearings, Keene, N. H., in sizes ranging from 2-10 mm. o.d. and made of beryllium, stainless or chrome steel. The bearing races are machined from solid bar stock and highly finished on raceway and exterior surfaces. Each bearing is equipped with four balls of the same material as the cup and fitted with a retaining cap.

Yale Self-Dumping Hopper Speeds Small Parts Handling When Used With Electric Fork Truck

Yale self-dumping hopper

Yale & Towne Manufacturing Company, 4530 Tacony St., Philadelphia 24, Pa., describes its new self-dumping hopper as speeding handling of small parts, loose materials and scrap. This all-metal skid bin with a hinged bottom can be picked up and moved by hand-lift truck, but the dumping operation can only be accomplished when the hopper is employed in conjunction with an electric fork truck.

Dumping is accomplished by elevating the hopper by means of the truck forks until the bin handle engages with a positive-action catch at the top of the truck elevating column. The forks are then lowered, leaving the hopper suspended. The unsupported hinged bottom opens, allowing the contents to pour forth whenever desired.

The empty hopper is easily released from the catch on the elevating column by raising the forms. The feed hopper is then lowered on the forms and carried away for refilling.

G-E Electronic Control Welding Voltage Regulator

A new voltage regulator for use with most G-E resistance-welding controls that include the phase-shift method of heat control, has been announced by the Industrial Control Division of the General Electric Company, Schenectady. It is designed to regulate the welding current automatically, so that it is held constant regardless of line-voltage variations of as much as plus 10 or minus 20 percent.

Known as the CR7503-D157, the regulator consists of a resistor circuit connected to the power line which supplies the welding machine, and

G-E voltage regulator

an electronic circuit. When the regulator is in use, this electronic circuit functions not only to hold the average voltage of the resistor current constant, but also changes, electronically, the phase control voltages of the main welding control panel.

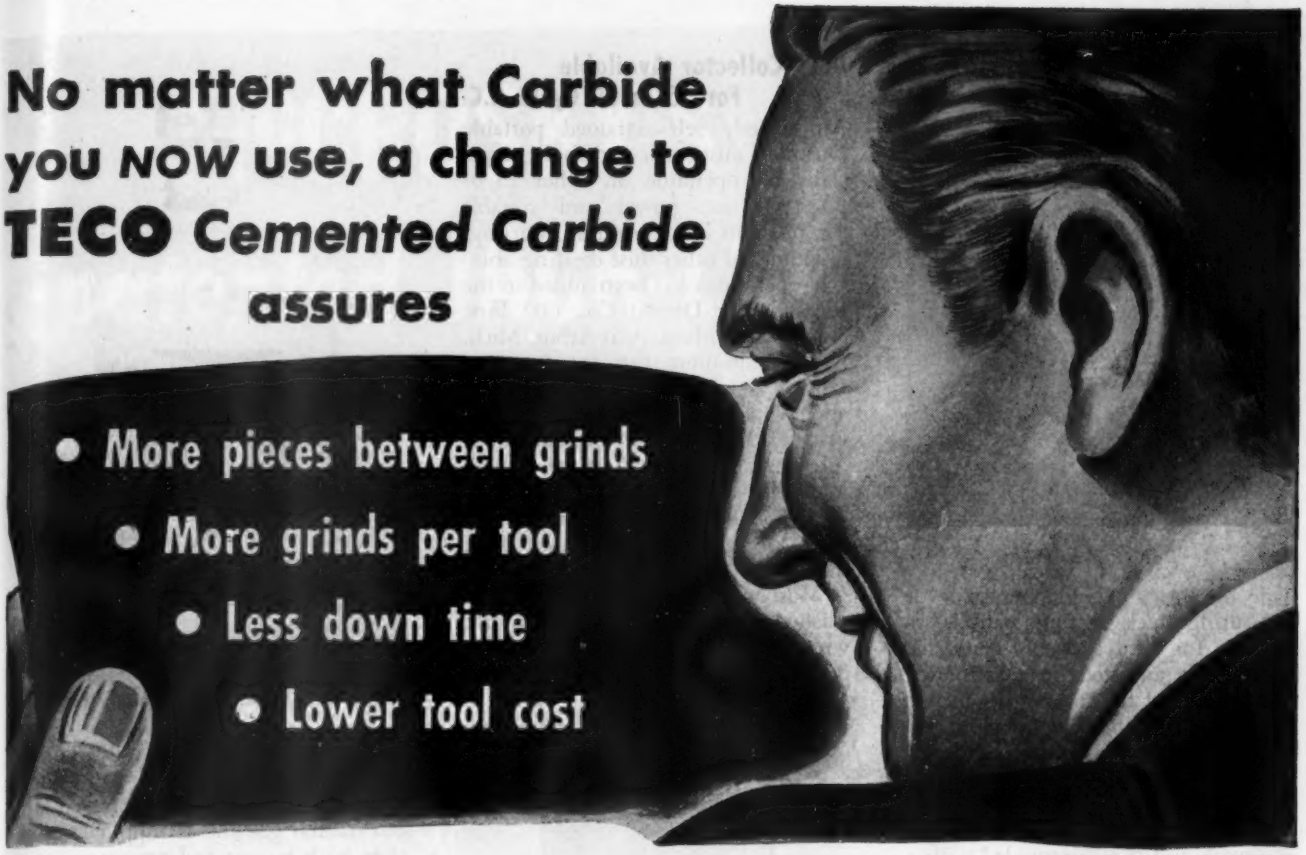
The regulator, which is housed in a sturdy, easily opened steel enclosure, can be used on welding circuits whose power factor is from 20 to 70 percent, and can be operated from 230/460/575 v. on a 50/60-cycle power supply.

Continental Machines Offers Line of DoAll Comparators

Continental Machines, Inc., 1301 Washington Ave., South, Minneapolis 4, Minn., manufacturers of DoAll precision gages and instruments, now offers a complete line of comparators. The basic feature of the new comparator is its wide range of magnification, which enables one comparator to do the work which formerly required as many as four standard ones. Each comparator has four magnification ranges, enabling work to be checked over a wide range of tolerances.

The spindle is equipped with variable pressure adjustment to pro-

No matter what Carbide you NOW use, a change to TECO Cemented Carbide assures



This is no mere advertising claim. It's being done in many plants. You can prove it in your own. Here's how:

Simply replace your present carbide tools on any machine, with TECO Cemented Carbide Tools. Run exactly as before—then see for yourself that TECO Carbide stays on the job longer—produces more pieces. TECO Cemented Carbide is more resistant to wear and breakage because it is harder, denser, more uniform. Available in styles, grades and sizes for practically every machining need. Have a tool engineer discuss your requirements. Write for catalog and price list.

IMMEDIATE DELIVERY FROM STOCK

can be made on most standard TECO Cemented Carbide Tools and Blanks.

ARMY E NAVY

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Branch Office: 2906 Euclid Avenue, Cleveland, Ohio

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TECO

Pioneers in Tungsten Carbides for over a Quarter Century

TECO

CEMENTED CARBIDE

DoAll comparator

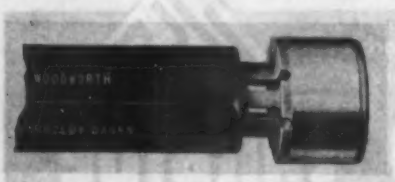
vide the exact pressure required for measuring thick or thin sections, as well as for hard and soft materials. Pressure is adjusted by a calibrated dial located at the top of the unit.

The spindle movement is magnified electrically, assuring exact repeat readings. The spindle head is provided with an adjusting collar for raising the spindle to accommodate the work and is also provided with a hair-line adjustment knob for setting the indicating pointer on the comparator dial. The gage head swivels 360 deg. in horizontal and vertical planes. The protractor provided shows the angle to which the gage head is tilted. The gage head can be removed from the stand and used on a surface plate, machine tool, multiple gaging fixture or any other special application.

Woodworth Company Introduces Gages with Segmented Shanks

N. A. Woodworth Company, Ferndale, Mich., is producing a new type Carboloy gage with an exclusive segmented shank which is described as being lighter in weight, better balanced and assuring less operator fatigue and more accurate inspection.

The segmented shank is said to compensate for the difference in the coefficient of expansion between cemented-carbides and steel. Also the slots permit "breathing" to allow for expansion or contraction resulting from temperature changes with no distortion to the carboloy gaging member.



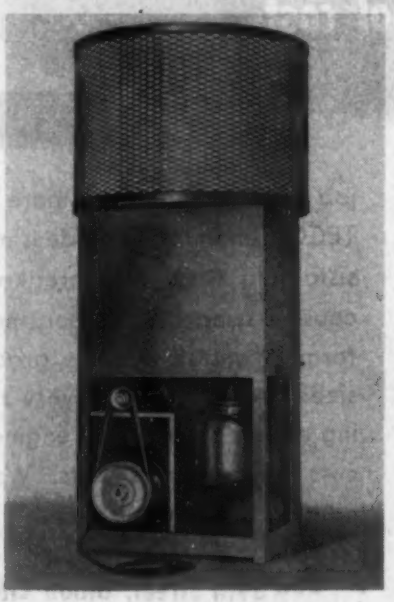
Woodworth segmented shank gage

Dust Collector Available For 25 or 50 Cycle A.C.

An entirely self-contained portable Dustkop dust collector, built especially for operation on either 25 or 50 cycle a.c. power and suitable for medium duty grinding, burring, tapping and other dust creating abrasive operations has been added to the line of Aget-Detroit Co., 602 First National Building, Ann Arbor, Mich.

The minimum fan speed, maintained by a V-belt overdrive, is about 3,450 r.p.m. The air speed velocity developed by the unit in the inlets is approximately 4,450 ft. per min. and is adequate for most industrial dusts, including small chips from cast iron tappings and light milling operations.

Most of the cleaning is accomplished in the cyclone separator, which is automatic and does not require any maintenance attention. The



Aget-Detroit Dustkop

Dustkop can be easily connected to the source of the dust by a flexible metal hose or sheet metal pipe. The cyclone separates the dust from the air automatically, collects the dust in a jar and the air returns to the working space through a spun glass filter material, forming the top of the unit.

The motor is available in standard voltages and thus the Dustkop can be connected to the grinder so that both that and the dust collector can be turned on and off simultaneously.

Knapp Portable Rivet Heating Forge for Small Space Use

A new small gas-fired rivet heating forge, convenient for getting into confined spaces, is being made by

Knapp portable rivet heating forge

James H. Knapp Co., 4920 Loma Vista Ave., Los Angeles 11, Calif. The forge operates on compressed air and natural gas and is supplied complete with burner and necessary control valves.

The design of the forge is said to permit easy charging and removal of rivets without discomfort to the operator, while it is claimed that the bottom lining of the chrome refractory will not slag with rivets.

The forge weighs 85 lb. and is fitted with lifting hooks for easy moving even when hot. Heating space is 8 in. dia., 7 in. deep.

Compar Splash Curtains Guard Against Splash and Impact

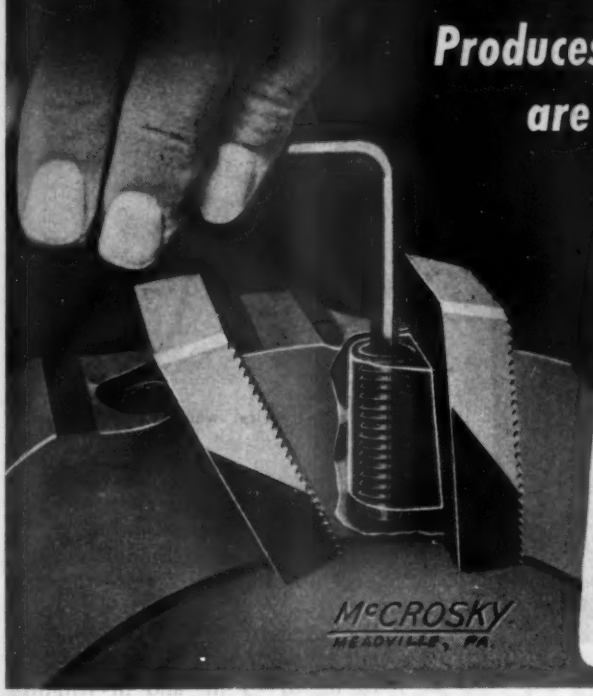
Splash curtains for the protection of machine operators are one of the new uses for transparent sheets of compar, the flexible rubber-like synthetic developed by Resistoflex Corporation, Belleville, N. J. The compar is described as completely immune to oils and solvents. Since it is completely transparent, machine performance is visible at all times, and operators no longer run the chance of getting dermatitis.

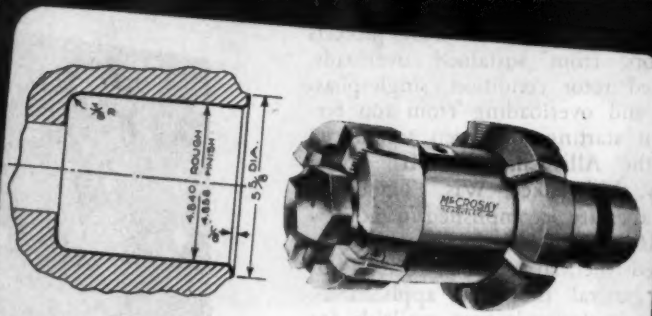
These splash curtains also furnish protection in testing departments where hydraulic fluids are carried under great pressure, because the great tensile strength of compar protects workers from the impact of the high-pressure fluid.

The flexibility of compar makes possible the tailoring of splash curtains to order for any type of machine. The material is said to be abrasion- and wear-resistant.

McCROSKY'S *exclusive patented* JACK-LOCK WEDGE

Produces standard and special tools that are strong and rugged...yet easily adjusted, reground, rebladed





Multiple Operation Tool for Facing, Chamfering, and Boring Hole with Radius in Bottom

The shape, simplicity and small size of McCrosky's exclusive, patented Jack-Lock Wedge recommends it particularly, for mounting multiple blades in small space.

When tightened — see view above — the screw bears against the bottom of the recess, — raising the wedge — *like a jack* — locking the blade rigidly in the tool body with a powerful compound wedging action. With the Jack-Lock, — multiple blade tools attain the strength and rigidity of solid tools, — yet release of the blades for adjustment, regrinding or replacement is quick and easy.

Specify McCrosky — leader for 40 years — for "standard", — or "special" inserted blade tools that do 3, 4, 5 or even more, related boring, counter-boring, facing and reaming operations *at the same time*, increasing production and cutting costs.

Catalog 178 describes McCrosky Multiple operation "Special" Jack-Lock Tools.

Catalog 168M describes McCrosky standard Jack-Lock Tools

COST CUTTING TOOLS

McCROSKY TOOL CORPORATION
MEADVILLE, PA.

Designers and Manufacturers of

Jack-Lock MILLING CUTTERS — *Block Type* BORING BARS

Wizard CHUCKS AND COLLETS

Super Adjustable REAMERS — *Turret* TOOL POSTS

Allis-Chalmers cage motor starter

Allis-Chalmers Magnetic Reduced Voltage Motor Starter

A new magnetic, reduced voltage cage motor starter, which protects motors from sustained overloads, locked rotor condition, single-phasing and overloading from too frequent starting, has been announced by the Allis-Chalmers Mfg. Company, Milwaukee, Wis. These advantages are accomplished in the new "ARC" starter with an accurately calibrated, thermal overload relay. Built for general industrial applications, the new starter is now available for control of motors from 5 to 2,500 hp., up to 5,000 v., 3-phase, 50 or 60 cycles.

Reduced voltage, two-point starting is obtained with a built-in auto-transformer, utilizing accurate, synchronous motor-driven, adjustable timing relay for transition from starting to running position. Interrupting capacity rating of the new starter is ten times the motor's full load current.

Acromark Marking Machine Has Interchangeable Fixtures

A new and improved machine with interchangeable fixtures for marking gage handles, ring dies, holders or

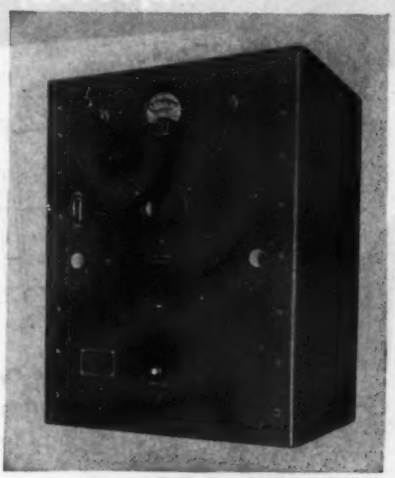
Acromark interchangeable marking machine

similar parts has been announced by The Acromark Company, 7-13 Morrell St., Elizabeth, 4, N. J.

Fixtures can be mounted and dismounted in a matter of seconds, while the size of marking can be changed by loosening one setscrew and inserting a complete die wheel. The depth of marking is said to be readily controllable and easily adjusted.

Marks may be made in a straight or a curved line and changes readily made. There is an adjustment to alter the radius of curved lines to suit parts of various sizes; curved line spacing is controlled by the operator and may be set as required.

Special inspectors' symbols or one of a large variety of standard designs may be placed in the die wheel. Fixtures hold a wide range of parts easily adjusted by untrained help.



Industrial voltage-breakdown tester

Industrial Instruments Has New Voltage-Breakdown Tester

The Type P-3 voltage breakdown tester, recently announced by Industrial Instruments, Inc., 17 Pollock Ave., Jersey City 5, N. J., is said to provide a simple, positive, safe and quick means of testing voltage breakdown of materials or components.

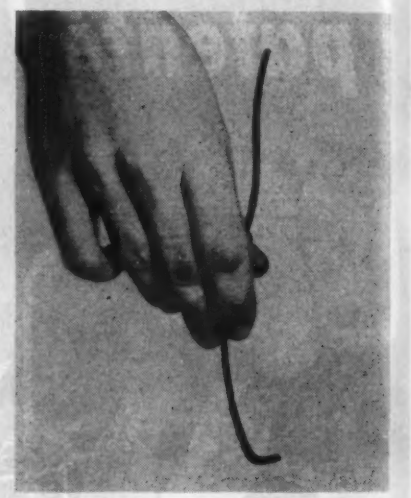
Operating range of the instrument is 0 to 10,000 v., d.c., or 0 to 8,000 v., a.c. The voltage is continuously variable over the entire range.

The voltage-breakdown tester operates directly from 110-130 v., 50/60 cycle a.c. line. Breakdown is indicated by a red signal light, while the built-in meter indicates the direct-reading voltage. Current-limiting resistors safeguard the equipment in the event of a dead short, by limiting the current to approximately 50 milliamperes.

Drawer-switch type fixtures are available with a jig to take given components or materials; when the drawer is closed the voltage is applied with absolute safety to the operator.

Minnesota Mining Develops Cloth Wound Abrasive Strip

Minnesota Mining and Manufacturing Company, Saint Paul, Minn., has developed an Elek-Tro-Cut Three-M-ite cloth reinforced spiral wound



Elek-Tro-Cut spiral wound abrasive strip

abrasive strip. The center is reinforced so the abrasive strip can be bent over, reached down through a center and threaded through an oil hole or opening that requires finishing.

The abrasive strip is available in a wide range of grits, in diameters of 1/16 in. to 1/4 in. and in lengths of 4 in. and shorter up to 12 in.

Baldor Electric Announces Improved Seven-Inch Grinder

The Baldor Electric Co., 4351-59 Duncan Ave., St. Louis 10, Mo., announces development of a new 7 in., "7,100 series," grinder.

The grinder is described as including the following features: specially designed motor which is cool running when carrying normal load and which has 100 percent overload capacity; pre-lubricated ball bearings which require no lubrication during their entire life; first grade wheels balanced with Baldor patented balancing flanges.

Baldor seven-inch grinder

FOR REDUCED DRESSER COST PER PIECE...

TRADEMARK

...ON A WIDE RANGE OF GRINDING WORK

For a wide range of rough, semi-finish and finish grinding work, you'll find the Diamond-Impregnated Carboloy Dresser gives uniform, trouble-free results at a substantial saving in dresser cost per piece. The Carboloy Dresser conserves diamonds, eliminates all remountings, can be reconditioned in 2 to 5 minutes and has an unusual ability to withstand accidental abuse. Three sizes. Immediate deliveries.

Send for catalog DR-100

CARBOLOY COMPANY, INC.

Sole makers of the Carboloy brand of cemented carbides

11149 EAST 8 MILE STREET, DETROIT 32, MICHIGAN

Birmingham, Chicago, Cleveland, Los Angeles, Milwaukee, Newark, Philadelphia, Pittsburgh, Thomaston, Conn.

Also sold by leading Mill Supply Distributors

Another USE FOR CARBIDES

CARBOLOY CEMENTED CARBIDE DIAMOND DRESSERS IMPREGNATED

For GENERAL USE ON GRINDING WHEELS

Palmer-Shile positioner

Palmer-Shile Positioner For Stock Containers

A stock positioner manufactured by Palmer-Shile Company, 780 S. Harrington Ave., Detroit 17, Mich., is designed to eliminate lost motion and reduce worker fatigue. It holds materials or small parts in containers within easy reach of the operator.

The device is portable and may be spotted at machine or bench in the most effective position. It is adapted to hold any kind of container—kegs, cans, crates or boxes. It is built of angle iron and bar stock and is mounted on 3 in. metal casters.

The positioner is built to order, to meet the user's requirements.

Lincoln Electric Announces Electrode for A.C. Operation

A new general-purpose electrode for mild steel, designated as Fleetweld 35, and made specifically for operation on alternating current, has been announced by The Lincoln Electric Company, Cleveland, Ohio.

The new shielded arc electrode, which will also operate on d.c. with either polarity, depending upon the type of work being done, is available in 1/8 in., 5/32 in. and 3/16 in. sizes.

The as-welded weld metal specimens test tensile strength, 62,000 to 70,000 psi; yield strength, 52,000 to 57,000 psi.; ductility (elongation in 2 in.) 23 to 30 percent.

Fleetweld 35 conforms to American Welding Society specifications for arc welding electrodes classes E-6010 and E-6011, is made in the standard 14 in. length and is packed in 50 lb. containers.

Aeroil Burner Electrically Heated Plast-O-Dip Tank

A new, electrically-heated, Plast-O-Dip tank has been designed by the Aeroil Burner Company, West New York, N. J., for the heating, melting and dipping of Ethyl-Cellulose compounds.

The unit features completely uniform, indirect heating through the medium of an agitated hot oil bath that completely surrounds the material, and also places heat in the ethyl-cellulose without any possibility of localized over-heating, "hot spots" or degradation of the melt.

Both tank and removable cover are completely insulated. Tests have shown an over-night heat loss in the compound of only 10 F. per hour, with all heat off. Two thermostats automatically hold the oil bath at any desired temperature. A built-in dial thermometer permits easy checking of the oil bath temperature.

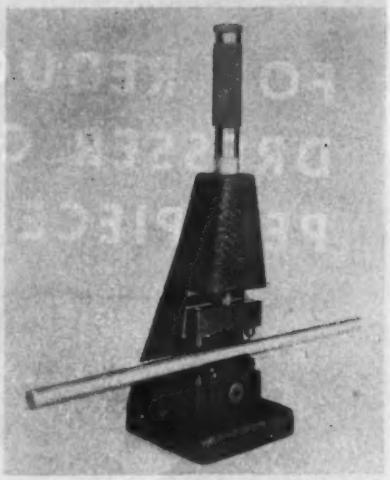
Aeroil Plast-O-Dip tank

Other specifications include: 110 or 220 v., a.c.; uses two 4.5 kw. heating elements with liquid-proof covers and heating coils sealed within steel blades; dipping space, 25 in. long, 13 in. wide and 12 in. deep.

Baldwin Gage Point Punch Is Double-Acting and Adjustable

The Baldwin Locomotive Works, 940 Simpson St., Eddystone, Pa., has begun marketing a gage point punch which is double-acting and on which impact force is adjustable for different materials.

Of this gage point, it is stated that: 1. it marks four uniform centers on specimen with one push of the handle; 2, it automatically centers either round or flat specimens; 3. the impact force is applied manually by an adjustable detent which eliminates the use of a hammer; and, 4. impact and size of punch marks is adjustable to suit soft and hard specimens.



Baldwin gage point punch

The upper punch holder, guided in a heavy frame, is attached to the impact-adjustable handle. The entire upper punch point assembly is spring supported to keep the gap between punch points open for largest specimen. When specimen is placed on support, the upper handle is pushed down until all punch points rest on specimen. A continued push downward on the handle brings to a pre-adjusted compression a second spring within the tubular knurled handle, releasing potential energy to produce impact on the specimen.

S & B Engineering Company Thread Slide Speeds Reading

An easy-reading thread slide, developed by S & B Engineering Company, 507 N. St. Clair St., Pittsburgh, Pa., consists of a pocket and a slide of Bristol board on which is printed all specifications for screw and nut for classes 1, 2, 3 and 4 fine and coarse threads. As the slide is moved, a slot in the pocket exposes readings for any desired size screw. Tables on the pocket facilitate obtaining readings to fit special thread dimensions and tolerances, and for special screw sizes.

It is said that even a beginner can set up a thread-making machine properly by following the specifications listed on the slide, and that the slide also makes it possible for a drafting department to reduce description on blue prints by simply specifying the class of thread. All computations on the slide are based on U. S. Bureau of Standards specifications.

There is hardly an industrial field that does not use one or more of the many products listed and pictured on the pages of this new Baldwin bulletin. Between its covers you may find ways that Baldwin can help you with your immediate production problems or with your post-war plans.

A handy index of all the major products of The Baldwin Group, arranged in accordance with their applications in particular industries, will enable you to see at a glance where Baldwin can be of service. A request for Bulletin 211, on your regular letterhead, will bring this book to your desk without obligation on your part.

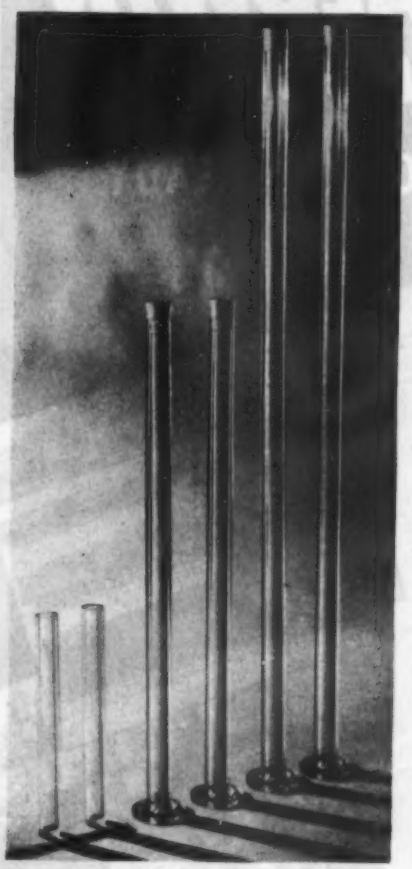
The Baldwin Locomotive Works, Philadelphia, Pa., U. S. A. Offices: Philadelphia, New York, Chicago, Washington, Boston, Cleveland, St. Louis, San Francisco, Detroit, Houston.

BLW THE BALDWIN GROUP

BALDWIN

The Baldwin Locomotive Works, Philadelphia, Pennsylvania: Locomotive & Ordnance Division; Baldwin Southwark Division; Cramp Brass and Iron Foundries Division; Standard Steel Works Division; The Whitcomb Locomotive Co.; The Pelton Water Wheel Co.; The Midvale Co.

Parts and Materials



Celanese plastic fuel gages

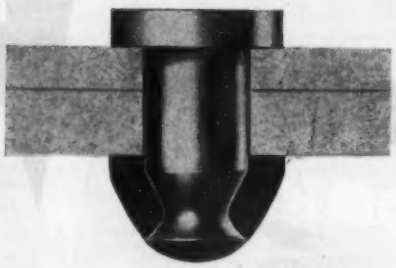
Celanese Corporation Makes Non-Shattering Fuel Gages

Celanese Celluloid Corporation, Plastics Division of Celanese Corporation of America, 180 Madison Ave., New York, is producing plastic fuel gages of lumarith or celluloid. These gages come in a variety of thicknesses and lengths and severe impact does not dent or break them. They are being used in planes, tanks, and on many types of war and industrial machinery.

Hi-Shear Fastener Eliminates Use of Heavy Bolts and Nuts

Pheoll Manufacturing Company, 5700 W. Roosevelt Rd., Chicago 50, Ill., has been appointed prime licensee by North American Aviation, Inc., for the manufacture of the new Hi-Shear Rivets developed by that company.

In comparison with both the bolt and nut and the ordinary rivet, Hi-Shears are said to save assembly time, save materials, cut down weight, and cost less to use. They eliminate the necessity for heavy bolts, nuts and shims, or the use of more rivets of softer material.



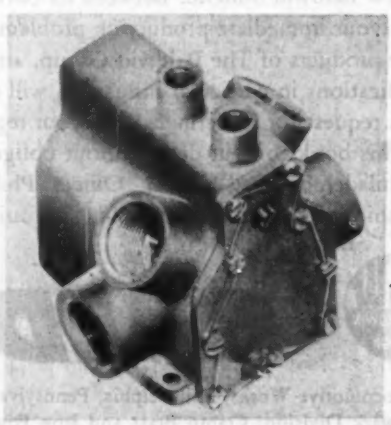
Pheoll Hi-Shear Rivets

The rivet consists of the pin and the collar. The pin is made of alloy steel, heat treated to a minimum tensile strength of 125,000 lb. per sq. in. and cadmium plated. The collar is made of A17ST aluminum alloy anodized. The shear strength is the same as that of the corresponding size standard aircraft bolt.

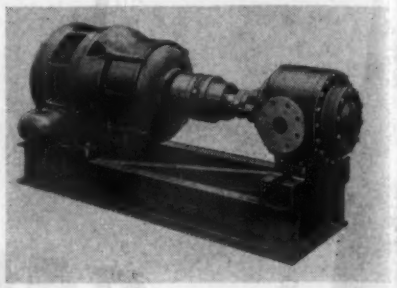
Adel Precision Announces New Remote Positioning Valve

A new remote positoning 4-way control valve, No. 13261, announced by Adel Precision Products, Burbank, Calif., is said to eliminate cable controls, push-pull rods and other mechanical controls.

The new valve permits regulation of high-pressure hydraulic systems with the Adel Isodraulic remote control system. It is adaptable for a large variety of control installations in combination with standard units.



Adel remote positioning valve



Blackmer 500 psi. pumping unit

Blackmer Produces 500 Psi. Discharge Pressure Pump

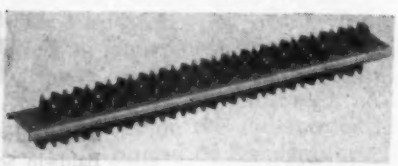
A new pumping unit capable of discharge pressure of 500 psi. with rated capacities of 50 and 90 g.p.m., has been designed and put into production by the Blackmer Pump Co., Grand Rapids 9, Mich.

The new pump is built in all iron and bronze fitted construction. Standard motors with separate gear reduction or gearhead motors may be used. Units are also available for engine drive. Several of the new units have been furnished for pumping oils of various types and they have been designed for handling similar liquids having lubricating properties.

Curtis Feed-Thru Terminal Blocks for Sub-Panel Mounting

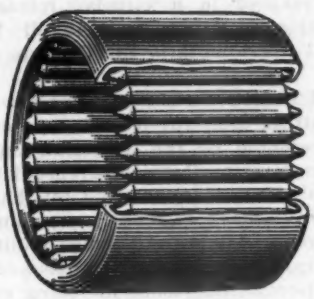
Curtis Development and Manufacturing Company, 1 N. Crawford Ave., Chicago, Ill., has introduced a feed-through terminal block for sub-panel mounting. It consists of individual feed through terminals, molded in Bakelite, which are permanently held in a metal strip in any combination desired. Blocks are now produced with any number of units from 1 to 16.

Terminals are described as having ample clearances and leakage distances for circuits carrying up to 300 v., 20 amp. Center to center distance between terminal units is 5/8 in. No. 8 screws are used on each side of terminal units for securing connection.

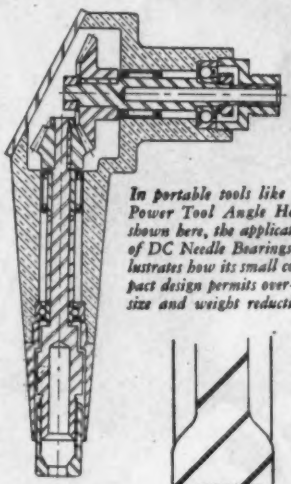


Curtis feed-thru terminal block

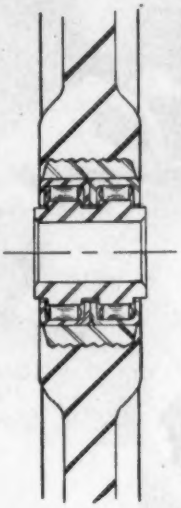
To Reduce Weight Use Needle Bearings



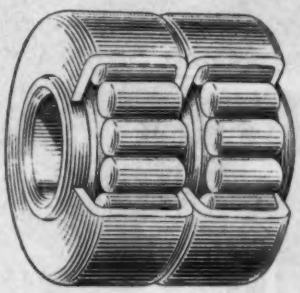
TYPE DC



In portable tools like the Power Tool Angle Head shown here, the application of DC Needle Bearings illustrates how its small compact design permits over-all size and weight reduction.



Full advantages of anti-friction operation with resultant weight savings in aircraft pulleys is obtained through Needle Bearings. X-section shows the double row PN Type.



TYPE PN (Double Row)

HIGH CAPACITY IN SMALL SPACE MAKES LIGHT WEIGHT NEEDLE BEARINGS IDEAL ANTI-FRICTION UNITS FOR MANY APPLICATIONS

•

In applications where weight and space are at a premium, the use of Needle Bearings has been widely adopted as the ideal solution to many design problems. For the Needle Bearing's full complement of small diameter rollers held within a compact retaining raceway provides a unit which is extremely *light* in relation to its high load capacity. Furthermore, the small over-all size of the Needle Bearing enables the design engineer to reduce size and weight of the bearing housing and frequently of other component parts as well—without sacrifice of strength, efficiency, or performance.

Ample testimony to the weight saving as well as other important features of Torrington Needle Bearings is found in the widespread use of many types in the aircraft industry. For example, in a single fighter plane, the Republic P-47 Thunderbolt, there are 57 applications of Torrington Needle Bearings all contributing weight reduction *and* improved performance!

Expressed another way—in a laminated plastic aircraft pulley equipped with the double row PN Type Needle Bearing there is weight saving which represents a net increase in the pay load.

In applications in other fields weight savings may be translated into greater operating efficiency and economy, increased sales appeal, or savings in packing and shipping costs.

In your own work toward the elimination of excess or unnecessary weight, investigate the advantages offered by Torrington Needle Bearings. The possibilities offered may surprise you. Our engineering department will gladly render every assistance in laying out applications to secure the full advantages of Needle Bearings in any design job. Or if you wish more preliminary information write for a copy of the Torrington Needle Bearing Catalog No. 30A.

THE TORRINGTON COMPANY

Established 1866 • Torrington, Conn. • South Bend 21, Ind.

"Makers of Needle Bearings and Needle Bearing Rollers"

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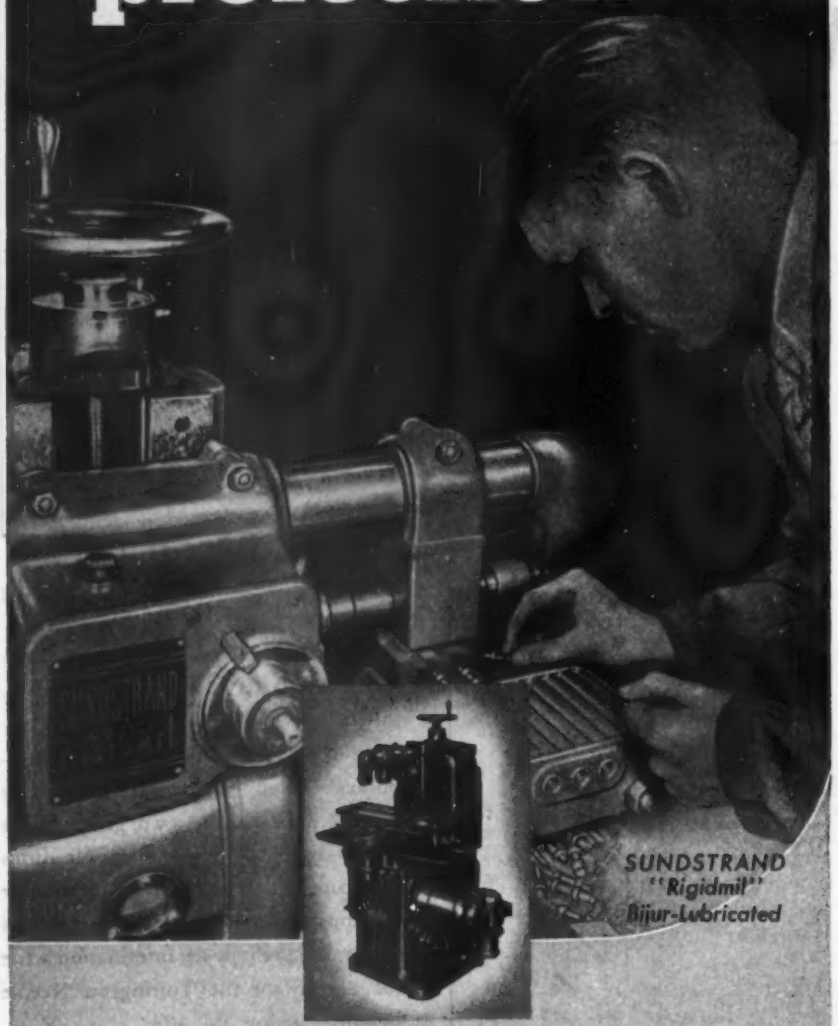
NEEDLE BEARINGS

HIGH SPEED **protection . . .**



■ With industry geared to a constantly increasing tempo, high production rates must be maintained over long periods of time. Long runs, multiple shifts, extended hours . . . these and other emergency conditions make efficient lubrication all the more essential. BIJUR automatic "metered" lubricating equipment is doing its part in assuring quality production at top speeds.

BIJUR LUBRICATING CORPORATION, LONG ISLAND CITY, N.Y.

BIJUR

AUTOMATIC *Metered* LUBRICATION

TRADE PUBLICATIONS

BROACHING Zagar Tool, Inc., 405 Erie Bldg., Cleveland 15, Ohio, has issued a circular on its improved broaching machine. Complete data is given on the features, advantages, application, specifications and price of the unit.

CARBIDE TOOLS Specifications and prices on a complete range of taper and straight checking reamers are presented in a circular released by Chicago-Latrobe Twist Drill Works, 411 West Ontario St., Chicago 10, Ill.

CUTTING TOOLS A complete line of cutting tools for precision products is presented by the American Cutter & Engineering Corp., Warren, Mich., in a bulletin just announced by that company. Some 47 models are illustrated among which are included milling cutters, shank tools, form tools and other miscellaneous tools, including carbide-tipped. A section on the care of cutting tools contains many valuable suggestions.

CUTTING TOOLS Information on ground thread cutting tools and hobs is contained in Bulletin No. 644 announced by the Universal Engineering Corp., Cedar Rapids, Iowa. The U-6 Automatic thread milling machine is described and data on special gages, jigs and fixtures is also included.

DRIVES Catalog FBD-44, available from The American Pulley Co., 4200 Wissahickon Ave., Philadelphia 29, Pa., contains 25 pages of information on American steel split pulleys and bushings, shaft collars, shaft hangers and bearings, split and solid conveyor pulleys, motor pulleys, belting and Econo-matic drives for short-center flat-belt drives. The application, design and advantages of group drives are also discussed. Bulletin SJ-44 covers speed-jack drives, and Catalog HT-44 covers Hi-Torque motor pulleys.

DIE CHASERS "More Production from Landis Chasers" is the title of a booklet offered by the Landis Machine Co., Waynesboro, Pa. It discusses the care and operation of tap chasers and die chasers and explains the advantages to be gained from their correct use and care.

GRINDING CUTTERS A booklet on how to grind inserted blade milling cutters is being distributed by the O. K. Tool Co., Inc., Shelton, Conn. Among the subjects covered by this little handbook are the selection of wheels, setting up the cutter, clearance angles, general grinding procedure, grinding "O K" blade cutters, face mills and end mills, angular cutters, boring heads or counterbores and other similar operations. Sections on adjusting cutter blades and reblading cutters are also included.

HYDRAULIC EQUIPMENT The Aldrich Pump Co., Allentown, Pa., has released Bulletin No. 50, a 60-page illustrated book designed especially for engineers and those concerned with pumps and hydraulic equipment. The book is divided into three sections, the first of which contains hydraulic information and tables including water head equivalents, pump plunger loads, pressure equivalents, capacity of shafts, electrical data, friction losses in fittings and pipes, barometric pressures, pipe data and other engineering information. The second section is devoted to Aldrich manufacturing facilities, and the third section is a condensed catalog of Aldrich pumps and hydraulic equipment.

HYDRAULIC GAGES A four-page bulletin describing and illustrating several types of hydraulic gages, construction and specifications, has been issued by the Watson-Stillman Co., Roselle, N. J. This publication covers direct stem and flush mounted gages for use on hydraulic presses and pumps where accurate, trouble-free indication of hydraulic pressures is essential.

HYDRAULIC PRESSES Two bulletins on hydraulic presses have been announced by the Watson-Stillman Co., Roselle, N. J. Bulletin No. 650A covers extrusion presses, cold-molding presses and preform presses. Bulletin No. 330A describes the vertical-horizontal general utility press which can be used in the vertical position for such operations as forcing, bending, straightening and pressing, and in the horizontal position for bending structural shapes, pipe, and bars, press fitting, forcing gears on or off, discs, wheels, etc.

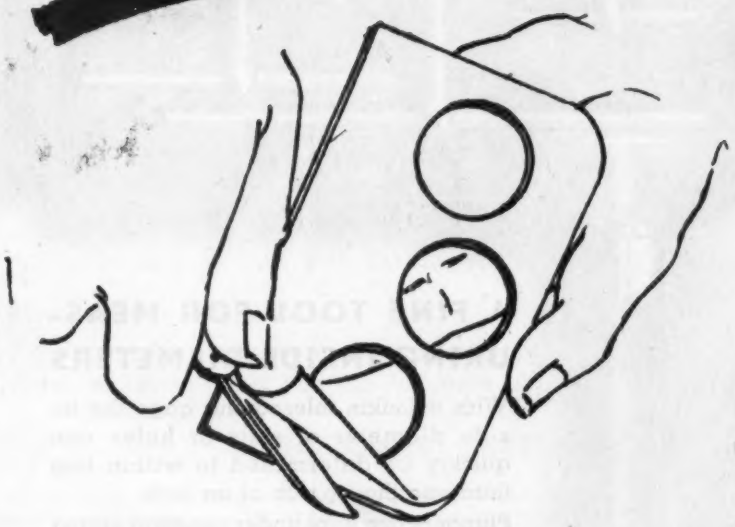
MATERIALS HANDLING The Mercury Mfg. Co., 4044 South Halsted St., Chicago 9, Ill., has published Bulletin 7-11, 40 pages of useful information on material handling problems. In addition to complete descriptions and specifications on all Mercury trailers, tractors, lift trucks and other devices, the book includes brief treatises on the applications and advantages of the various units. WPB regulations on the purchase of such equipment are appended.

NITROCELLULOSE A basic textbook on the properties and uses of soluble nitrocellulose, base for plastics, lacquers, coated textiles and many other products, has been announced by Hercules Powder Company's Cellulose Products Department, Wilmington, Del.

PORTABLE TOOLS The "Do-All" combination electric hammer and drill and accessories are described in Bulletin 442 released by the Wodack Electric Tool Corp., 4627 West Huron St., Chicago, Ill. The bulletin is complete with prices and sizes.

POWER PRESS The No. 256 thirty-ton flexible power press for bending,

accuracy two ways



REPLACE skill-wasting methods with quick precision while insuring accuracy of fit. Use Laminum shims to provide correct adjustment in both shop assembly and field service.

Shims cut to your specifications. Stock shim materials obtainable from your dealer. Write us for further information and shim application chart.

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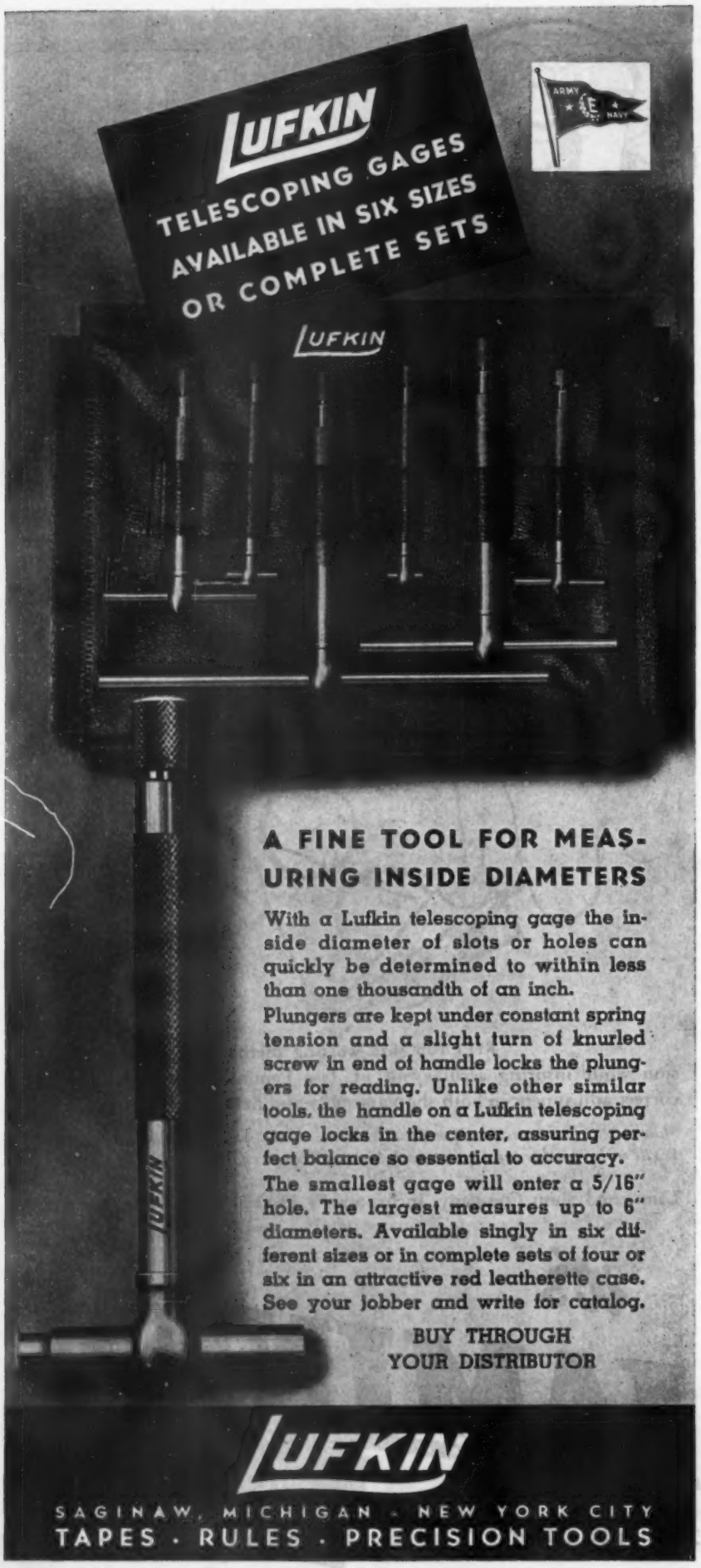
THE SOLID SHIM THAT peels FOR ADJUSTMENT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TELESCOPING GAGES
AVAILABLE IN SIX SIZES
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A FINE TOOL FOR MEASURING INSIDE DIAMETERS
With a Lufkin telescoping gage the inside diameter of slots or holes can quickly be determined to within less than one thousandth of an inch.
Plungers are kept under constant spring tension and a slight turn of knurled screw in end of handle locks the plungers for reading. Unlike other similar tools, the handle on a Lufkin telescoping gage locks in the center, assuring perfect balance so essential to accuracy.
The smallest gage will enter a 5/16" hole. The largest measures up to 6" diameters. Available singly in six different sizes or in complete sets of four or six in an attractive red leatherette case.
See your jobber and write for catalog.
BUY THROUGH
YOUR DISTRIBUTOR
LUFKIN
SAGINAW, MICHIGAN · NEW YORK CITY
TAPES · RULES · PRECISION TOOLS

straightening and pressing is described in Bulletin No. 376 available from the General Mfg. Co., Detroit 11, Mich. The bulletin is illustrated and contains full information on the uses, advantages, mechanical operation, specifications and attachments of this unit.

PROFILING ATTACHMENT The Heckethorn Mfg. & Supply Co., Littleton, Colo., has issued a bulletin on its Hecomatic infeed and chucking attachment built to handle profile work on a Cincinnati centerless grinder. Closeup photos show the attachment from various angles with accompanying text to describe its installation, features and operation.

QUENCHER Bell & Gossett Co., Morton Grove, Ill., presents its junior quencher, for controlled quenching where small pieces are heat treated, in Catalog JC-744. This smaller system is said to have all the positive control features of larger units, is completely self-contained, requires no storage tank, and reduces the cooling process to a purely automatic operation. Cross sectional diagrams show the action of the unit and a table of specifications give complete operational data.

REAMERS Chicago-Latrobe Twist Drill Works, 411 West Ontario St., Chicago 10, Ill., has released a four-page circular on its high-speed spiral fluted chucking reamers. Prices and dimensions are given on the complete range of taper and straight shank reamers.

REDUCTION UNITS Catalog No. 300, issued by The Cleveland Worm & Gear Co., Cleveland, Ohio, is a comprehensive exposition of Speedaire fan cooled worm gear reduction units. The Speedaire principle is explained by means of cutaway photos, charts, diagrams and engineering tables. Following the descriptive matter are detailed instructions for planning installations of these units. Rating tables for six sizes ranging from 4¾ to 12 in. centers are given as are data on dimensions and shipping weights.

REGULATORS Victor Equipment Co., 844 Folsom St., San Francisco, Cal., has printed a bulletin which presents five different types of Victor single and two-stage reduction regulators employed in the welding industry. Design and construction features are thoroughly disclosed through the use of cutaway photos and complete specifications are given on each type. Specify Form 40.

SAFETY Copies of Bulletin No. 15 entitled "Safety Through Management Leadership" may be secured from the Director, Div. of Labor Standards, U. S. Dept. of Labor, Washington 25, D. C. The bulletin states that industrial accidents can only be prevented by management leadership, effective or-

ganization, thorough training and good supervision and discusses at length each one of these topics. Also outlined are three safety programs for small, medium and large plants.

SCALES The Yale & Towne Mfg. Co., 4350 Tacony St., Philadelphia 24, Pa., is offering Catalog R-44 to those executives concerned with problems of materials handling. It presents the full story of the entire Kron scale line from dormant and platform types of special counting, batching, tensile strength and dyamometer models. The book is illustrated and includes complete specifications and dimensions of every standard Kron item.

SCREWS The American Standards Assn. has approved a supplement, No. B12.3a-1944, to the A. S. socket setscrews and socket head capscrews, No. B18.3-1936. The supplement gives dimensions of stripper bolts (hexagonal and fluted type socket head should screws) in eight nominal sizes ranging from ¼ to 1¼ in. Copies may be obtained for 10 cents from the American Standards Assn., 29 West 39 St., New York 18, N. Y.

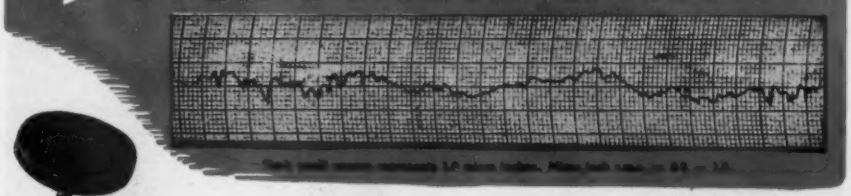
SEPARATORS The new magnetic-automatic coolant separator for use on honing machines and grinders is presented in Bulletin No. 151 by the Barnes Drill Co., 814 Chestnut St., Rockford, Ill. This self-contained, motor driven unit is fully automatic, requires no cleaning and can be started or stopped at will. The bulletin describes in detail the many features of this separator, explains its use and gives complete specifications.

SHEARS Watson-Stillman Co., Roselle, N. J., has announced publication of Bulletin A-6 which describes improved features of hydraulic and hand shears for cutting commercial grade wire rope, flat bars, round bars and varying shapes and metals. Specifications, capacities, spare parts and prices are included.

SPEED REDUCERS A 92-page Catalog and Engineering Manual No. 144, published by Winfield H. Smith, Inc., Springville, Erie Co., N. Y., presents valuable information on such subjects as speed reducer design, ratio range hp. and torque ratings. Selecting the reducer, construction, overhung loads, lubrication, chain pull factors and flexibility are a few of the topics also discussed. A complete engineering section includes widely used formula, tables and charts. Requests must be made on company letterhead.

SPEED REDUCER An eight-page Bulletin No. 250 has been prepared by the Philadelphia Gear Works, Inc., Erie Ave. and G St., Philadelphia 34, Pa., on its AirKooled worm gear speed reducers. Besides a brief history of the development of worm gear speed reducers, the booklet contains design

Proof of a Better Finish



Surface Analyzer Tape Proves You Get a Better Finish With Chicago Wheels

These results were obtained at a rate of 10 pieces per hour in an aircraft parts plant. Material, X-13-15, Rockwell 60 to 57, grinds out .006 to .007 stock. Chicago Wheel used, ½ x ½ x ⅛", Grain 180, Grade L Arcite FV Bond. Spindle Speed 40,000 r.p.m. Lapping and super finishing eliminated on this job.

Can you match that finish? Sounds phenomenal, but you can do it with Chicago Wheels. And, the secret of their superiority lies in the new FV Bond, developed exclusively for Chicago Wheels, after 50 years' experience making wheels for the most accurate and precise applications.

Here's What FV Bond Will Do for You

- Reduce your wheel costs.
- Produce a better finish without sacrifice of production time — a finish so smooth that you can measure it in micro inches.

TRIAL WHEEL FREE!

Write or send the coupon today for a Chicago Wheel, made with this remarkable new FV Bond. Tell us grinder you use, size wheel and kind of material on which you will make your test.

For the duration, with full WPB approval, we are specializing on small sizes—anything up to 3" in diameter.

Write for Catalog and one of the new Engineering Survey Forms, a step in the direction of better finishing.

CHICAGO WHEEL & MFG. CO.

America's Headquarters for Mounted Wheels and Small Grinding Wheels

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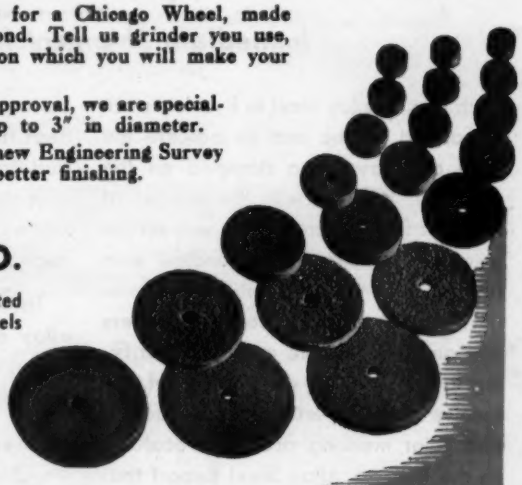

Half a Century of Specialization has Established our Reputation as the Small Wheel People of the Industry

AT-6

Send Catalog and Survey Form. Interested in ( ) Mounted Wheels. ( ) Grinding Wheels. ( ) Send Test Wheel. Size .....

Name .....

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Positive Identification for Ryerson Alloys

Confirms Quality...Prevents Shop Errors

Immediate Shipment from Stock

Each bar of alloy steel in Ryerson stock is painted on the end to indicate the type of alloy—then stamped on the side near the end with the number of the heat from which the bar was rolled. Smaller size bars are bundled and tagged with similar identification.

This is important because it offers you an unmistakable means of verifying the analysis of the alloy steel you receive from Ryerson. Heat number and color marking are also recorded on the Ryerson Alloy Steel Report that is furnished with each alloy shipment. This Report contains accurate data on the analysis, working temperatures and heat treatment response for quenched and drawn 1, 2, 3 and 4 inch rounds of your steel. This gives you reliable information for heat treatment that will produce the desired result.

The unique and valuable Ryerson alloy service is one of many reasons why it will pay you to concentrate your steel purchases with us.

Joseph T. Ryerson & Son, Inc., Plants at: Chicago, Milwaukee, St. Louis, Cincinnati, Detroit, Cleveland, Buffalo, Boston, Pittsburgh, Philadelphia, Jersey City.

RYERSON STEEL-SERVICE

features, ratings and limitations, a formula for determining the overhung load capacities, lubricating instructions and dimensions.

STEEL Crucible Steel Co. is offering two pieces of literature. One piece covers carbon tool steel drill rods giving complete information including size in inches and the decimal equivalents, weight in pounds per foot, and the approximate weight of a three-foot bar of each size. The other piece gives information on cold rolled and cold drawn specialty steels, lists their uses, specifications and other pertinent information.

STOP NUTS A catalog and data book on self-locking nuts has been issued by the Elastic Stop Nut Corp., Union, N. J. The book covers the hex, anchor and clinch types of nuts. Size, material, class fit, axial load strength based on pull-test data, military requirements, weight, finish and other information on these nuts is given in handy tabulated form.

THERMOPLASTIC Those engaged in the forming of sheet metal will find interesting reading in a booklet entitled "Tenite II Casting" offered by the Tennessee Eastman Corp., Kingsport, Tenn. This booklet gives a detailed description of the procedure to be followed in casting Tenite II, a thermoplastic material. This material is said to permit casting to finished size in the die without the scraping and polishing which is necessary with metal punches; to be relatively unaffected by temperature changes; and to be easily machined.

WELDING Some thirty-five major questions relating to costs, operation, maintenance, design, and installation of battery welding equipment developed for various forms of resistance welding are answered in a booklet entitled "The How and Why of Storage Battery Welding," published by the Progressive Welder Co., 3050 East Outer Drive, Detroit 12, Mich. According to the booklet, new battery welders can be used on any material capable of being resistance-welded, and their operation does not require a trained technician.

Good Catalogs Sell Machines

INDUSTRIAL ENGINEERS laying out large war plants (some are still being built in a hurry) complain that machinery builders do not supply sufficient information in their catalogs. For heavy machines, these men specially want the size of the baseplate, and size and location of the bolt holes so that a foundation can be accurately laid out in advance. Full details of the motor horsepower, voltage and wiring connections are also desired to aid in providing electrical power systems. Vendors that take the trouble to put such information in their catalogs may find that half the selling job is done.

NEW BOOKS

BROACHES AND BROACHING—97 *pages. Published by Broaching Tool Institute, 7½ Trinity Place, New York 6, N. Y.* $3.

It is the purpose of this volume to bring to American industry a comprehensive discussion of broaching practice to call attention to the very rapid recent progress in the broaching field and to emphasize the application of broaching to both war and postwar production. The data which forms the basis of this book was chiefly contributed by the engineering staffs of the broach manufacturers who are members of the Institute. The principles outlined and the examples and practical application cited are taken from the first-hand experience of engineers in their daily contact with broaching problems.

Chapters are devoted to: History of broaching; advantages, applications, limitations of broaching; types of broaches; broach cutting action; material to be broached; broach design; information needed for design and manufacturing of broaches; broach cost factors; handling broaches; sharpening broaches; broaching machines; setting up the broaching machine; fixtures; and cutting fluids.

PRACTICAL DESIGN FOR ARC WELDING, VOL. 1—*By Robert E. Kingead, consulting engineer in welding. Published by The Hobart Brothers Company, Hobart Square, Troy 1, Ohio.* $3.50 *per volume; complete 3-volume set* $10.

This is the first of three volumes to be published following the original publication and distribution of a number of the design plates in loose leaf form. It is an illustrated store-house of information and detailed drawings showing how tubing, plate, sheet, standard steel sections, angles and bars can be used to fabricate better, stronger, improved appearing products with arc welding and do it at substantially lower cost.

A complete work sheet in graph form is shown opposite each design plate. On these work sheets can be made notes, estimates and sketches as the design plate relates to the projected design. The record form provided on the working sheet can be used to suggest and analyze applications of design ideas to the user's own products, with permanent record of such procedure. All design plates are marked with the fundamental welding symbols of the American Welding Society and welding symbols are illustrated and described fully on a separate page in front of the book.

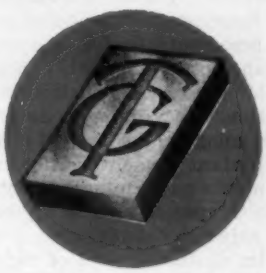
A cross reference "Short Cut to Design Ideas" index indicates the number of various design plates that involve certain specific details common in many welding applications.

Meet C. W. (Bud) BROKENSHIRE

SORRY you can't meet Bud in person. However, we do want you to feel that you know him better by this introduction. Bud's tool and gauge experience has been gathered in 25 years of practical experience. as builder, user, designer and supervisor.

Although some of his time is used in answering your phone call or letter, his big job, as chief engineer, is to try to give you what you want on your job, when you want it.

Turner manufactures plain cylindrical plug, ring, snap, flush pin, built up and special gauges. For complete information write our sales department.



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THE NEW TURNER PLAST-O-LOCK GAUGE

OPERATING AN ENGINE LATHE—*By Ray S. Lindenmeyer, assistant professor of industrial engineering, Northwestern Technological Institute. Published by Science and Mechanics, 154 East Erie Street, Chicago 11, Ill. 62 pages. Price 50 cents.*

The subtitle of this booklet, "Practical Lessons for the Beginner," outlines its intent. The intent is well followed in 51 short and easily digestible lessons, that can serve to guide home study of lathe operation.

Starting with an introduction to the lathe itself, each lesson takes up one small phase of the over-all operation, covering in logical sequence work- and toolholding devices, measuring instruments, cutting tools and files. To wind-up the lessons, several simple exercises are prescribed for the noviate to work on. In addition to information on lathe operation, basic facts about heat-treating, threads, lubrication and tools sharpening are included.

MAPI ACCOUNTING MANUAL—*Published by the Machinery & Allied Products Institute, 221 No. La Salle St., Chicago, Ill. Price $5.*

Designed primarily for use by capital goods producers, this accounting manual was prepared by the Institute's Accounting Council made up of financial experts from 20 leading metalworking companies. As a result, the Manual adequately covers the special accounting controls required in many capital goods industries. The book describes in clear detail each item of a representative balance sheet and profit and loss statement, explaining advisable practices in such items as depreciation, research and development cost, spoilage and scrap, all of which are important elements in determining settlements on terminated contracts.

A special section of the book is devoted to foundry cost accounting, outlining the method of determining unit casting costs by individual patterns or lobs, all the way from the cost of the metal at the spout down to the final step of cleaning the casting.

PRODUCTION, JOBS AND TAXES—*By Professor Harold M. Groves of the University of Wisconsin. 116 pages. Published by the McGraw-Hill Book Company, 330 West 42 Street, New York 18, N. Y. under the auspices of the research committee of the Committee for Economic Development.* $1.25.

This is a survey of the federal tax structure with recommendations for a postwar tax program intended to be conducive to high levels of peacetime production and employment. It is the first of some 20 research studies now under way or projected, which when completed will constitute a two-foot shelf of books applying both specialized study and practical business experience to help in solving all the

FACTS

ABOUT HARD CHROME PLATING

ONE of the principle advantages of chromium is its ability to resist corrosion.

However, it is sometimes true that chrome does not offer proper protection to the base metal itself due to its porosity. But, wherever this inadequate protection occurs, it is generally evident that the coating is too thin or the actual plating itself has been at fault.

It is obvious therefore, that a proper plating procedure cannot be overemphasized.

For example, the ability of Chromium to resist corrosion certainly could not be ignored as a protective coating for precision gage blocks . . . measuring accuracies in the millionths of an inch.

But the correct process of applying chromium to precision gages presented a major problem.

It was in 1937 that Elmer Ellstrom of the Dearborn Gage Company began to actively experiment with the practicality of finishing the gaging surface of Dearborn Gages with corrosion resistant chromium.

After exhaustive experiments the impossible was accomplished—Chrome was actually applied to precision gage blocks and without loss of accuracy in any manner.

This first major improvement in the manufacture of gage blocks brought to industry standards of measurements that would retain their true accuracies longer than any hard steel gage made; that is why Ellstrom-made gage blocks will last 2 to 5 times longer by actual test.

★ *This is number 2 in a series of articles by the Dearborn Gage Company on chromium plating.*

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Originators of Chromium Plated Gage Blocks

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ELLSTROM

MASTER SQUARE

★ Here's a new idea that multiplies the normal life of a square—an upright cylinder that can be turned to a new surface as wear develops during checking operations.

Another distinctive feature is that like the famous Ellstrom Gage Blocks all gaging surfaces of this Master Square are Chromium Plated to give longer wear.

Sizes start at 4 inches and can be obtained in larger dimensions as desired. Descriptive literature and prices sent on request.

FINISHED TO GAGE BLOCK STANDARDS

HYDRAULIC BALANCE

CANCELS OUT BEARING LOADS

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Diagram showing patented "Hydraulic Balance" construction.

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Balanced

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As illustrated by the diagram above, equal and opposing pressure areas are provided on the outlet side and on the inlet side of Vickers Balanced Vane Type Pumps. The equal and opposing radial hydraulic thrust loads cancel each other . . . consequently there are *no* bearing loads resulting from pressure. The major cause for wear is thus completely eliminated and the result is much longer pump life. This "Hydraulic Balance" construction is exclusive with Vickers Vane Type Pumps; it also permits an unusual design compactness and is an important reason for the exceptionally high efficiency of these pumps.

Vickers Balanced Vane Type Pumps are available in single-stage for 1000 psi (see Bulletin 40-25a); two-stage for 2000 psi (see Bulletin 40-16) and also two-pressure, large-small volume (see Bulletin 38-14). Vickers Application Engineers will gladly discuss with you the many different types of hydraulic power and control circuits on which these pumps have improved machine performance. Write the office nearest you.

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If You Need CONVEYORS That Can Give a "LIFT"... Ask STANDARD CONVEYOR!

BEFORE you decide on those changes — before you invest a cent of money — before a brick is laid or a nail driven — check your plan on the score of conveying and conveyors.

Conveyors can be built to do more than just carry in a horizontal plane. For example, push bar conveyors can carry and move packages and containers up a slope or incline at 30, 45, or 60 degree angles; vertical lift conveyors will carry commodities straight up and down to the height of several floors. These conveyors that lift and lower can be used individually or combined with a conveyor system to provide uninterrupted flow of commodities between floors.

Push bar conveyors and vertical lift conveyors are part of Standard Conveyor's wide variety of equipment — power and gravity conveyors in belt, roller, chain, and slat types; spiral chutes, tiering machines, portable pilers, pneumatic tube systems.

It's well to remember that Standard Conveyor has been headquarters for conveyors for more than 40 years; we are qualified by long experience to recommend and build efficient equipment for any given installation. Write for catalog AM-94, "Conveyors by Standard"—a profusely illustrated reference book that will prove very useful to you.

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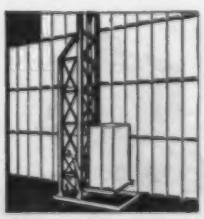
TIERING AND LIFTING MACHINES

PORTABLE PILERS

SPIRAL CHUTES

PNEUMATIC TUBE SYSTEMS

various transitional and long-term problems which will confront the national economy after the war.

Recommendations for revision of the postwar federal tax structure are based on the assumption that national government expenditures will be a great deal higher than in any previous peacetime period and may reach as much as $20,000,000,000, as compared to $9,000,000,000 in 1939.

Stretched Bolts Strongest?

TIGHTENING NUTS on bolts has long been a real problem. We've all seen an untrained man pull a bolt in two by using too big a wrench. Now J. O. Almen of the Research Division of General Motors tells us that the man with the wrench is our only hope for best results, when he knows his job. The torque wrench he says, depends too much on *how* it is used and on the thread fit between bolt and nut. In some cases he thinks it is better to stress the bolts above the yield point than to risk their not being tight enough. On through bolts, such as in airplane engine connecting rods, it is common practice to stretch the bolt a given amount, measuring the length with a micrometer.

He also discusses studs both long and short and the kinds of threads to be used. Both designers and shop men will do well to study the paper he presented at the last meeting of the Society of Automotive Engineers in January, 1944.

Flywheels for Milling Machine Spindles

FLYWHEELS on milling machine spindles are again coming into the limelight. It will be remembered that this received considerable attention about 25 years ago in connection with gear-cutting machines. The use of flywheels reduced chatter and consequently produced a better finish on the gear teeth. Then the use of flywheels seems to have been largely overlooked.

Recent developments in milling, using cutters with very few teeth, have brought flywheels to the front once more. They have become necessary to keep cutting speed uniform by preventing momentary slow-down as the cutter tooth contacts the work. Flywheels are now being widely applied but not always with knowledge as to the size, weight or location which will give best results.

For best results they should be as near the milling cutter as possible. Placing them at the other end of the spindle, which seems to be the only available place in many cases, permits torsional movement in the spindle. Flywheels on both ends are advocated where possible, as was used on the Rickenbacker automobile engine some years ago. It is a live subject and one that may require considerable study to secure best results.

Now—for the first time—standardized air gage spindles and components for checking long, short, through or blind holes at the gage or remotely at the machine or bench. *You can write your own specs!*

No more engineering time and charges! Deliveries shortened to a matter of days. Interchangeability of spindles and components enables adoption of complete air gaging program at minimum cost and minimum gage inventory.

No more GO and NO GO checking of internal diameters. Both tolerance limits are checked in one pass faster than either could be checked with a plug gage. Frequent, time-consuming and therefore costly, inspections of gages are eliminated. Precisionaire spindles outlast plug gages 10 to 40 times.

No more human element of error when you use the Precisionaire. Parts with tolerances ranging from .005" to fractions of .0001" can be checked quickly by unskilled and untrained operators who merely present the gage to the part or vice versa.

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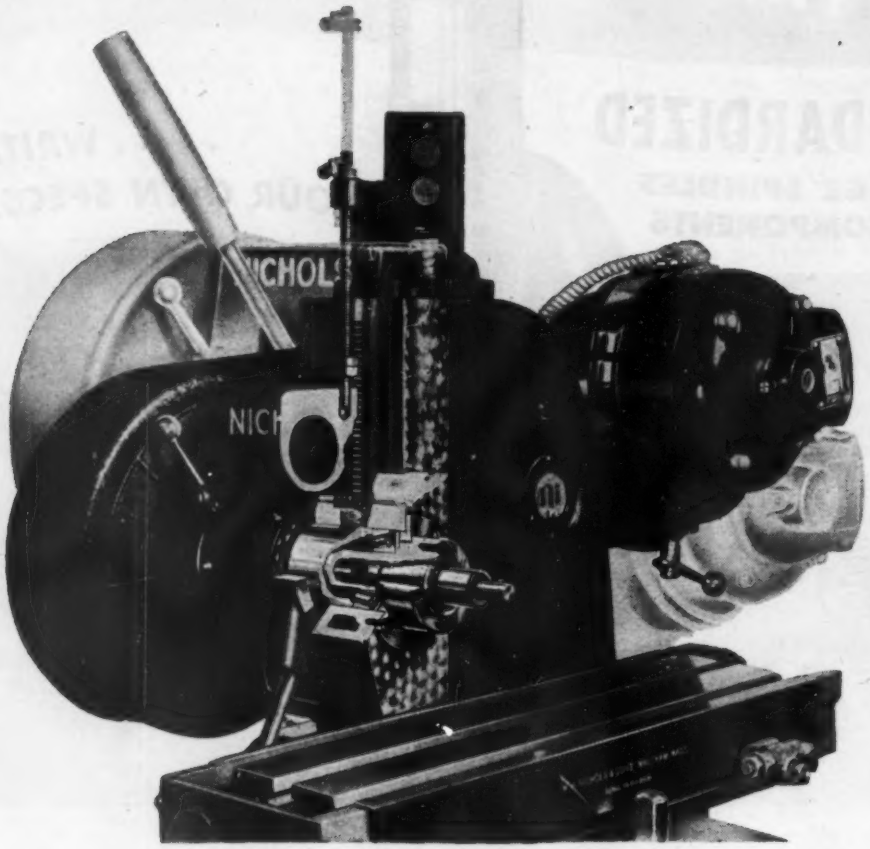
WRITE for Engineering Data No. 12 detailing STANDARDS and also showing SPECIAL applications.

HOW THE NICHOLS MILLER USES ITS HEAD



Bringing the cutter on a sliding head down to the work is a basic principle of the Nichols Miller, a *plus* factor that gives it decided advantages over other precision milling machines. By means of the rise-and-fall spindle, multi-purpose flexibility is possible with simplified set-ups...operations such as contour milling, form straddle milling and fly-cutting, among others, which would require far more intricate and expensive machine tools.

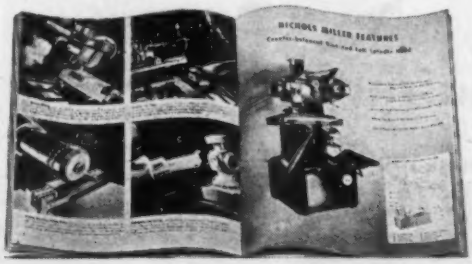
That's why on production lines and in toolrooms everywhere you can see Nichols Millers performing dozens of different high-speed operations...*to tolerances in "tenths."*

The counter-balanced sliding head, as shown in this cutaway view, brings the spindle to the work by manually controlled rise-and-fall motion. A hand-set depth stop locks the sliding head quickly in any position for conventional horizontal milling. By grinding the spindle mouth on its own bearings, runout is held within .00015".

Your present and post-war production requires precision and flexibility. You get both in the Nichols Miller. Investigate its many advantages today.

THE NICHOLS MILLER

"THE MILLER THAT USES ITS HEAD" • MFD. BY W. H. NICHOLS & SONS, WALTHAM, MASS.



FREE BROCHURE illustrates how industry puts the Nichols Miller through its paces. It's yours for the asking.

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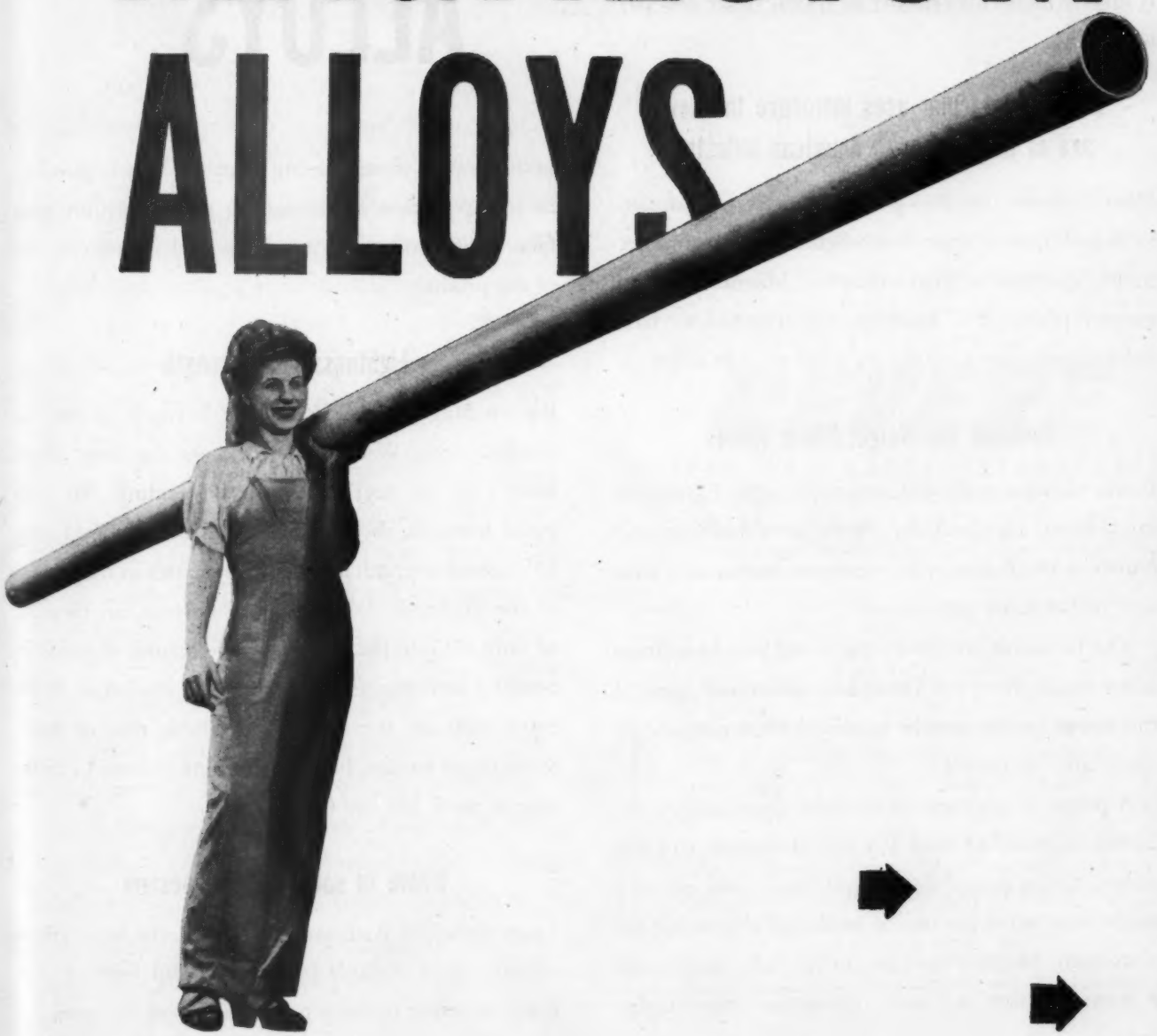
REVERE MAGNESIUM ALLOYS



Lightening the burden of weight on men and machines . . .

REVERE MAGNESIUM ALLOYS

EVERY pound of Magnesium Alloy substituted for other metals will save weight. In the case of steel, the saving with equal thickness is 77% and with Aluminum Alloy it is 37%.

Magnesium wing tips, floor beams, oil and fuel tanks, seats, engine parts, wheels, housings, fairings, panels and many other parts have effected tremendous savings in the weight of modern aircraft. The result is greatly increased capacity in speed, range and payload.

War's spectacular uses introduce the new age of magnesium to American Industry

Mass in motion requires power—to start, to maintain, to stop. Power is expensive whether it is steam, electricity, gasoline or man's muscles. Magnesium alloy pattern plates in a foundry, are reported to have reduced one man's lifting by 4500 pounds a day.

Consider the Weight-Power Ratio

Power varies directly with mass or weight. Disregarding friction, a magnesium unit requires less than one-fourth as much energy to overcome inertia as a steel unit of the same dimensions.

The favorable weight-strength and weight-stiffness ratios mean that very little, and sometimes none of this power saving need be sacrificed when magnesium alloys are substituted.

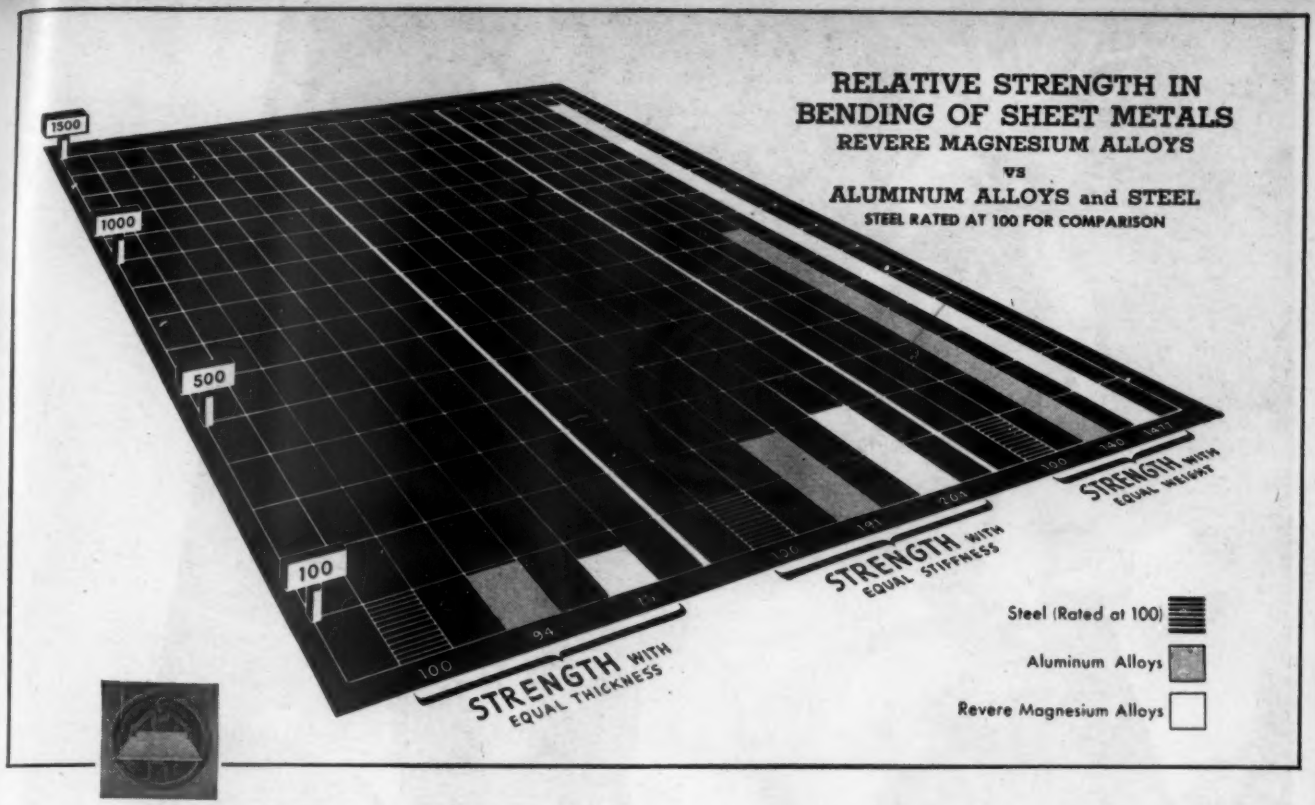
A pound of magnesium contains about 15½ cubic inches—a pound of steel 3½ and aluminum 10 cubic inches. On a pound for pound basis, you get 4½ magnesium units for one of steel and 1½ to one for aluminum. Magnesium goes further, and the further it goes the more you save. Remember that weight-saving means money-saving from the very beginning, in transportation and handling to and within your factory, in production processes, and in the end use of the product.

Lightness plus strength

Revere Magnesium Alloys offer strength as well as weight saving. With equal thickness, the sheet alloys have 75% of steel's strength in bending. To gain equal strength, the thickness need be increased only 15%, since strength in bending increases as the square of the thickness. To gain equal stiffness, an increase of only 65% in thickness is needed, since stiffness in bending increases as the cube of the thickness. With equal stiffness, the strength is double that of steel. With equal weight, bending strength is over 14 times that of steel. See the Chart.

Where to save with Magnesium

Transportation. Railroad cars, buses, trucks, trailers, aircraft. Will make it possible to haul heavier payloads in states limiting total weight on the road.



Hand-Operated Items. Anything pushed, pulled, lifted, carried. Vacuum cleaners and other household appliances; baby carriages; hand and portable tools; typewriters; instrument cases; luggage; hand trucks and dollies; mailing containers.

Reciprocating Parts. Anything that must be started, stopped, reversed in motion. Light weight and rigidity save power, reduce vibration.

Mill Products Available

Revere magnesium facilities are among the largest in the world. They offer sheet and plate, rod and bar, tube, extruded shapes, forgings and forging stock, in four different alloys.

May We Assist You?

The Revere Technical Advisory Service is at your command, ready to help you take full advantage of the remarkable qualities of Revere Magnesium Alloys. Let us show you how to use them to modernize and improve your own product, how production can be speeded up by increasing machining speeds, how to form, weld and rivet, simply, economically.

Write for your complimentary copy of the *new* 32-page booklet, "Revere Magnesium Alloys and the Light Metals Era," now coming off the presses. Presents the basic facts about magnesium, plus detailed technical data on the physical, mechanical and working characteristics of the Revere Alloys.

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Availability

Magnesium facilities were developed to help win the war. Now the supply is adequate and many applications other than in aircraft are being approved.

If your products can be improved by the use of Revere Magnesium alloys, we suggest you consult us about availability for civilian products.

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EQUIPMENT

More VERSATILE Machines for More PROFITABLE Work

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A customer writes: "... we have achieved a production rate of 500 L.V.T. amphibian tank axles per day, which is a record in production, considering that these axles are ground to .0006 of an inch tolerance.

We employ 50 people, and this is a rate of 10 axles per day per man. We achieved this record by using Cities Service grinding oil for our grinding operation, Chillo 93 for use in drilling and tapping—and your Sentry 2 as spindle oil."

More and more, it's service that counts...

and *Cities Service* means good service!

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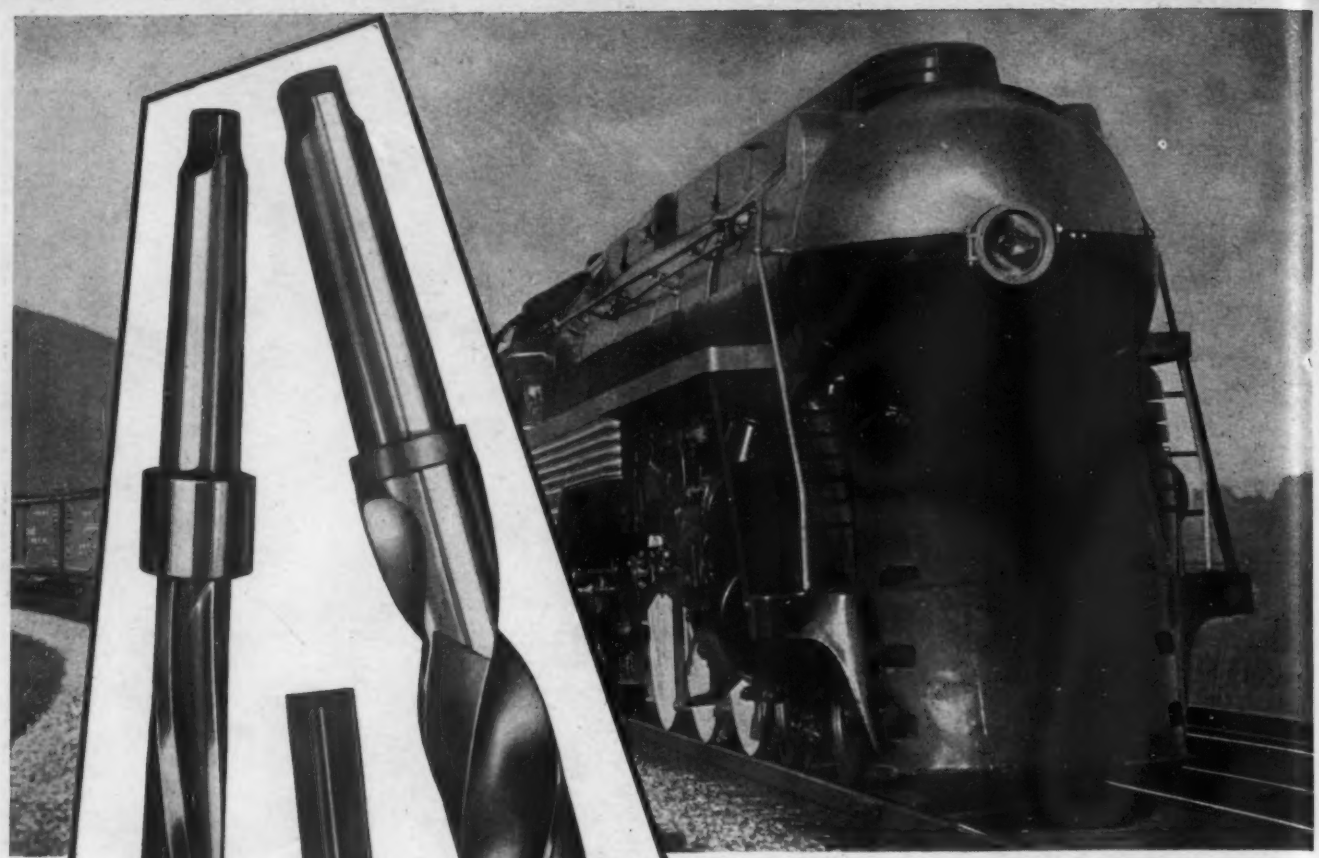
ARKANSAS FUEL OIL COMPANY



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There are no better symbols of rugged power and tough durabilities than a freight "hog" and the rails on which it runs—unless it's the tough, efficient little tools that drill them.

Celfor tools got their start drilling rails—and have been drilling effectively ever since: are, in fact, frequently chosen for the toughest jobs.

Here, indeed, is toughness you can take for granted. How the Celfor Process preserves and increases the inherent strength and stamina of finest tool steels is well illustrated by the Celfor Type B Reamer, made only by Clark; and equally proved by the Celfor high speed Twist Drill, forged to shape and hot twisted to densify and toughen the metal. No tools can surpass Celfors for cutting qualities and long, useful life. We know—for we make them. A good start toward lower tool costs and faster, easier drilling is to write us for full data.

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Mass production of parts for these and countless other weapons demands both speed and accuracy . . . a combination possible only through the use of high-grade cutting and soluble oils. Operators coast-to-coast are getting these results with Texaco.

Texaco Cutting Oils for example, permit higher speeds and feeds, with improved accuracy and surface finish. They lubricate the tools, and by carrying away the heat prevent chip welding; and lengthen tool life, assuring greater output.

So superior have Texaco cutting and soluble oils proved that they are definitely preferred in machining operations everywhere.

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TEXACO

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TUNE IN THE TEXACO STAR THEATRE EVERY SUNDAY NIGHT – CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

They wanted
TOY-SIZE fastenings
able to withstand

¾" long, .037" dia.
140 threads to inch.

BIG-GUN CONCUSSION

. . . and for these threaded "pin size" parts they chose a strong, corrosion-resistant INCO Nickel Alloy

The enemy isn't the only one to feel the shattering shock of a naval broadside. When the big guns thunder, everything aboard ship takes a beating.

Yet delicate vital instruments must function without a hitch. Every part . . . even the tiniest . . . must be able to withstand the tremendous concussion.

One such part in an essential instrument, is a fastening the size of a common pin . . . approximately ¾" long, .037" in diameter with 140 threads to the inch.

The metal chosen for this fastening needs:

corrosion-resistance, a necessity for sea-going equipment.
strength and toughness, to hold up under shock.
machinability, to permit speedy, economical machine production.

All of these requirements add up to "R" Monel . . . the corrosion-resistant alloy for parts where extra machinability is important.

* * *

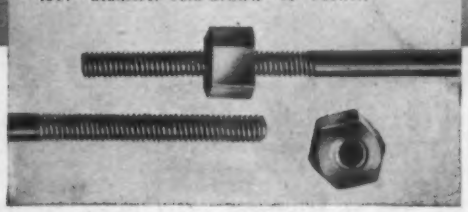
This use of "R" Monel is cited as an example of how INCO Nickel Alloys . . . such as "R" and "KR" Monel . . . often do the trick where a *unique combination* of properties is required.

If you have a problem involving metals . . . for equipment now in production, or planned for post-war . . . consult INCO Technical service. Write:

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York 5, N. Y.

Official U. S. Navy Photograph

140 THREADS TO THE INCH, *shown in this enlarged photograph, demonstrate the remarkable machinability of strong, corrosion-resistant "R" Monel. ("KR" Monel is suggested for applications where extra hardness is required.) The fastenings are machined from .037" diameter cold-drawn "R" Monel.*



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Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings

SPEED ALL CRATING JOBS WITH SKILSAW TOOLS!

WRAP UP A TANK...

All photos from Shappert Engineering Company, Belvidere, Illinois

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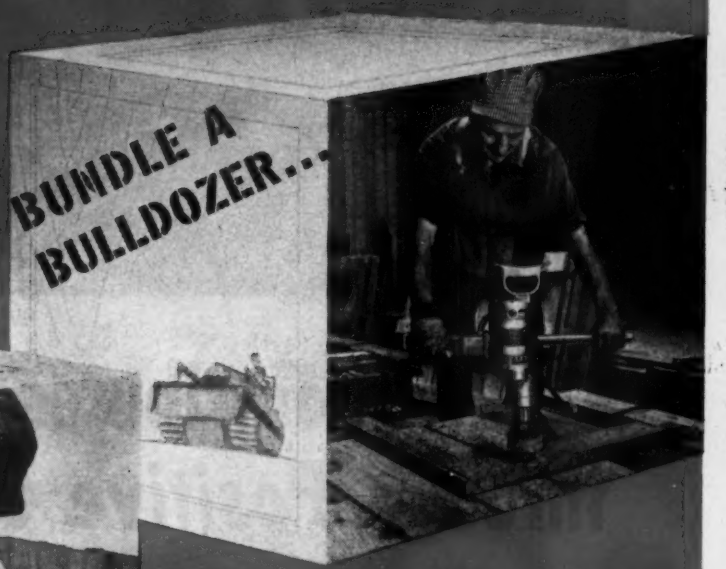
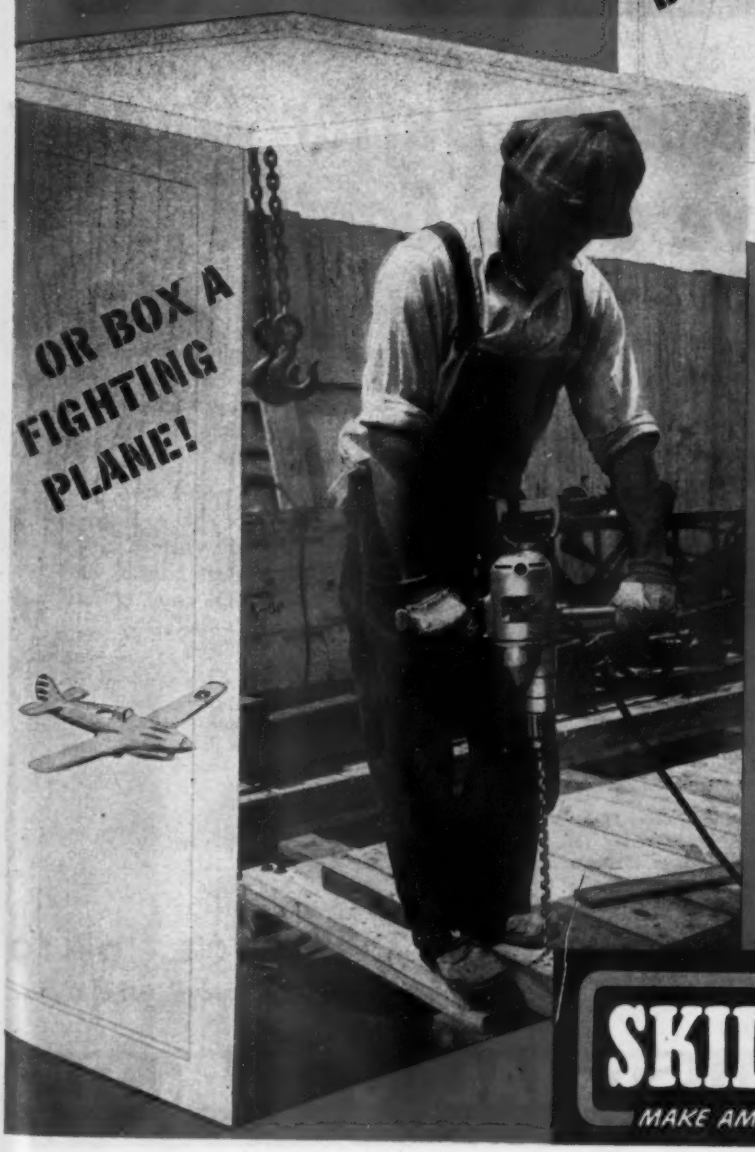


OR BOX A FIGHTING PLANE!



• You'll get any crating job done faster and better with SKILSAWS and SKILSAW DRILLS—just as they do at Shappert's, busiest crating contractors in the Middle West.

You can take these SKILSAW TOOLS right to the job—save time, save material handling, save manpower. Cut the lengths and widths you need on the spot. Drill lead-holes for screws and bore for bolts as the ends and sides go up. That's the way to speed all crating jobs.

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MAKE AMERICA'S HANDS MORE PRODUCTIVE

McCaskey contributes to *Better Quality* through *Positive Gage Control* ...

Positive gage control is an essential step in the control of quality. Faulty standards of measurement invariably result in the expensive production of many unsatisfactory parts.

The procedure instituted at *AIR ASSOCIATES, INC., TETERBORO, N. J.*, to prevent such production losses was described by W. Cortlyn Rhodes, Supervisor of Production Engineering, in a recent issue of *Factory Management and Maintenance*.

Control of the issuance and return of gages through the McCaskey Tool Control system is outlined as follows:

"Gage is issued to operator who executes tool loan order in triplicate for each item. Attendant marks ticket plainly with serial number of gage issued. Operator receives gage minus gage ticket, which attendant sends back to the gage control department along with duplicate copy of tool loan order.

Attendant subsequently files the original of tool loan order under operator's number in special file and the third in a similar file, according to gage size. These files furnish a complete cross reference on the employee and the item.

If gage is not returned before reinspection date, tool crib is notified and gage is recalled for check. If gage is returned to tool crib prior to periodic inspection (as it is in most cases), it is returned to gage control with third copy of tool loan order. Original copy of tool loan order is removed from operator's file."

McCaskey Tool Crib Control is used in hundreds of plants for the control of gages, general purpose tools, special tools, blue prints, safety equipment and other items loaned to employees as a part of production service. The system pays its way as a result of numerous direct savings.

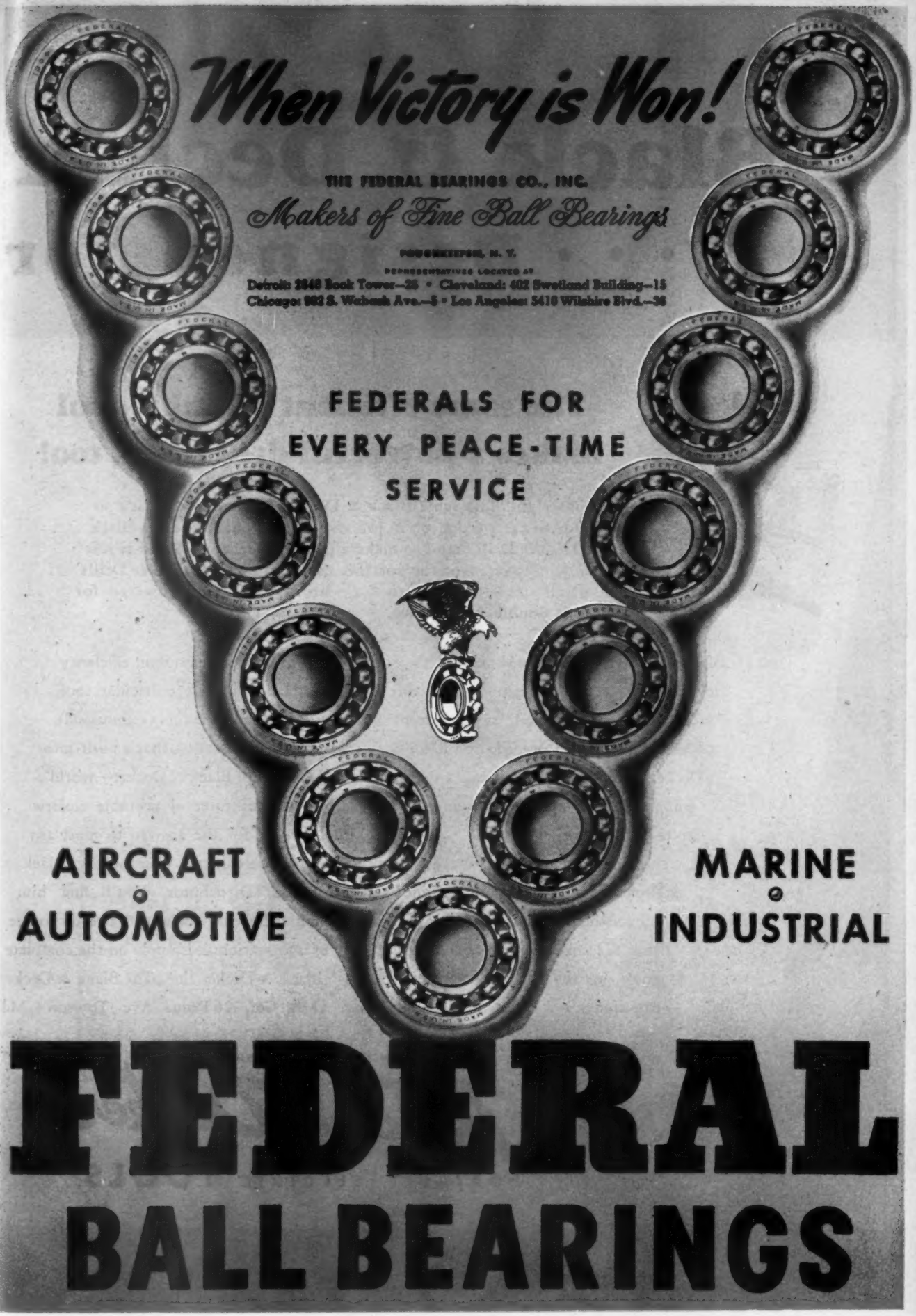
Reprints of the article "Better Quality Through Positive Gage Control" are available on request. Write today for a copy, together with similar reports of savings through the adoption of McCaskey Tool Crib Control in several other well known plants.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems Ltd., Galt, Ontario, Canada — *The McCaskey Register Co., Watford, England*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL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. . . Designed for

The same efficient portable tool makes a powerful drill press, too!

That's right! The same Black & Decker Electric Drill that's so handy to carry from job to job also clamps quickly into a Black & Decker Drill Stand to make a powerful drill press and is just as quickly removed for portable use. And Black & Decker Drills of all sizes—from ¼″ to 1¼″—are designed and powered for this double-duty service.

Black & Decker Drill Stands provide the leverage for a steady, smooth feed on precision work . . . as well as for tremendous pressure when needed. And Black & Decker Drills have what it takes to keep going under that pressure, on any job up to their rated capacity.

That's because each part in every Black & Decker Tool is specifically designed and made for the job it has to do. For example, Black & Decker uses no *stock* motors. The motor in any Black & Decker Tool is engineered and built completely *by Black & Decker*—to deliver maximum efficiency and performance in that particular tool.

Whether you buy one tool or thousands, get the extra satisfaction that's built into every product of Black & Decker—world's largest manufacturer of portable electric tools. And for the answer to most any tooling problem, call your nearby Black & Decker Distributor. You'll find him anxious to be of service and a ready source of information and supply on the complete Black & Decker line. The Black & Decker Mfg. Co., 716 Penna. Ave., Towson 4, Md.

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PORTABLE ELECTRIC **TOOLS**

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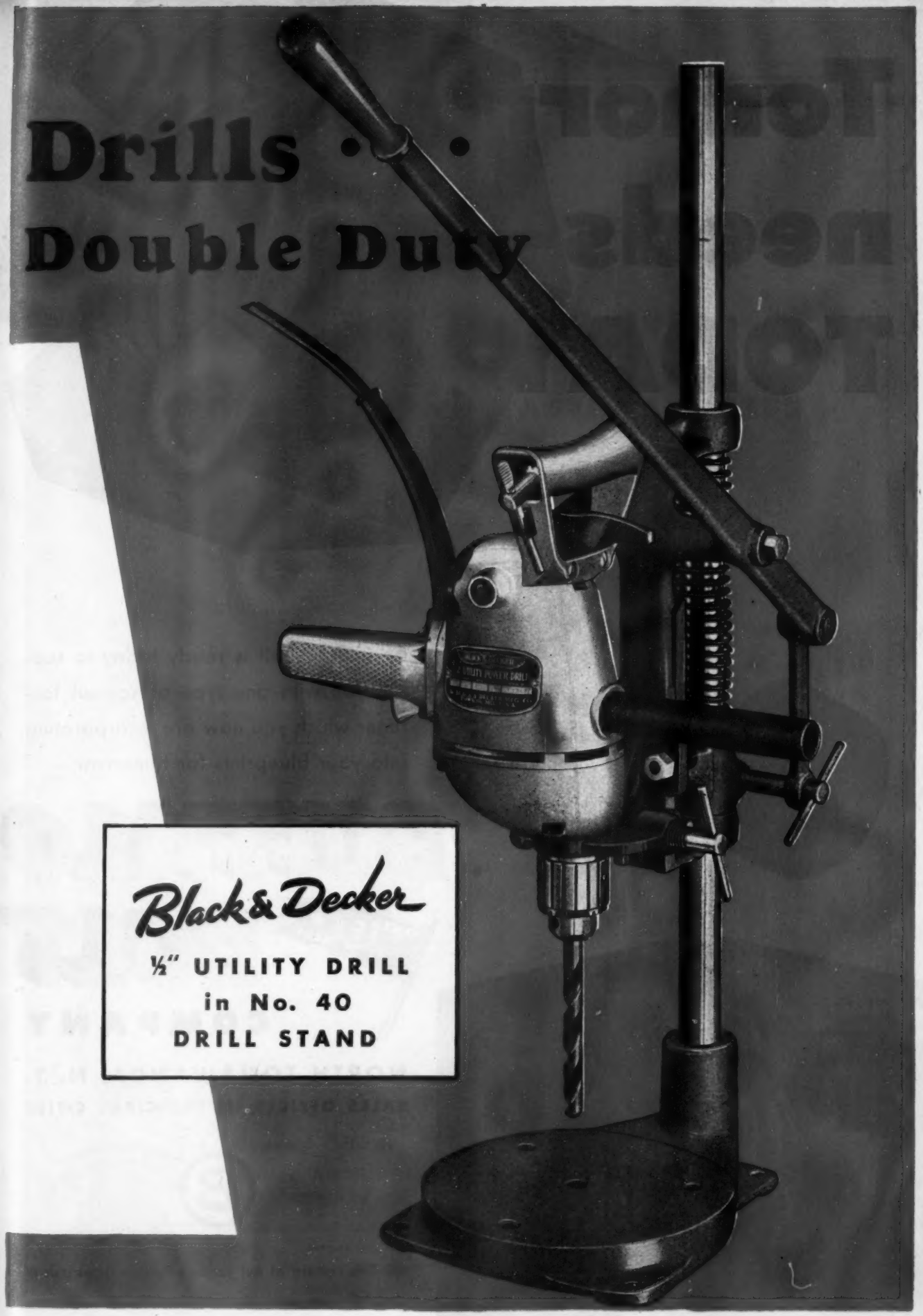
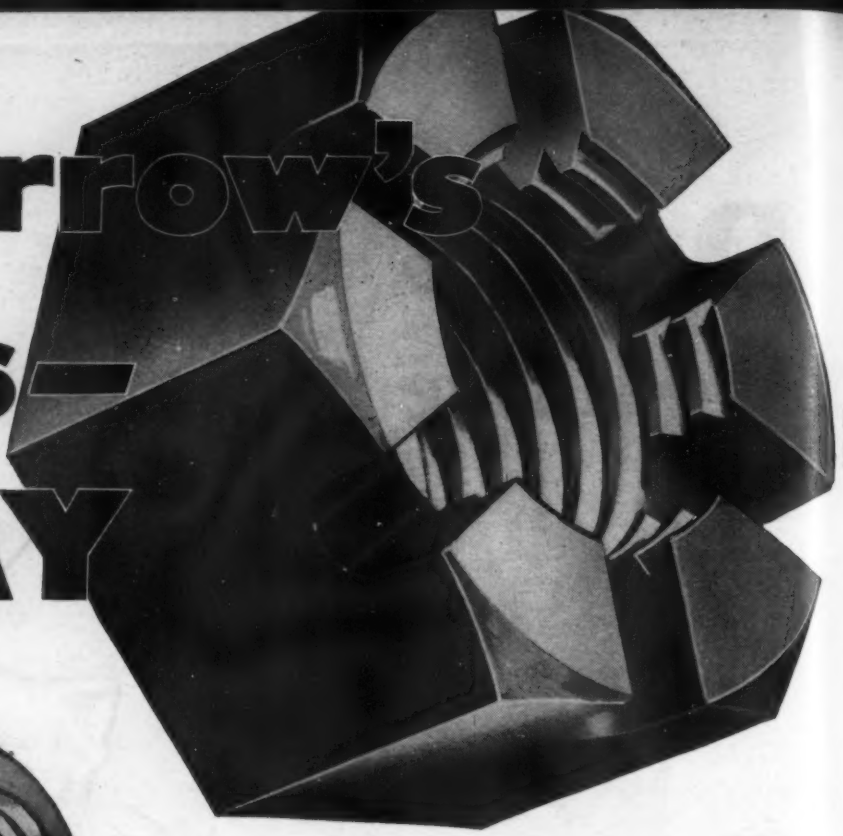
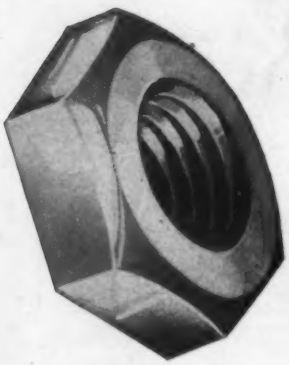


Black & Decker

½" UTILITY DRILL
in No. 40
DRILL STAND

Tomorrow's needs— TODAY





● Buffalo Bolt is ready today to supply you with any type of special fastener which you now are incorporating into your blueprints for tomorrow.

BUFFALO BOLT COMPANY

ARMY E NAVY

NORTH TONAWANDA, N. Y.

SALES OFFICES IN PRINCIPAL CITIES

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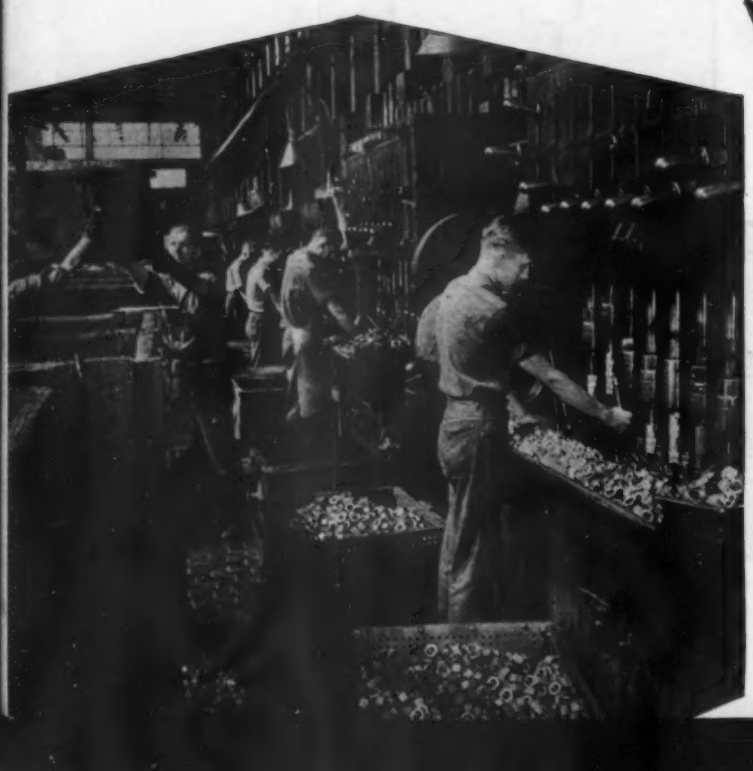

◀ This battery of nut tappers finishes thousands of circle Ⓑ nuts daily—in numerous shapes and sizes.

An Announcement

OF IMPORTANCE TO OUR

CUSTOMERS IN THE EASTERN STATES

EFFECTIVE as of August 31st, the plants of Empire Finished Steel Corporation at Newark, N. J. and Putnam, Conn. became the Empire Works and the New England Works respectively of Wyckoff Steel Company.

The acquisition of these properties augmented with the facilities of our Ambridge, Penna. Works will provide users of cold finished steels in the EASTERN STATES with the maximum degree of service at all times.

WYCKOFF STEEL COMPANY

General Offices: **PITTSBURGH 30, PENNA.**

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Manufacturers of Carbon and Alloy Steels . . . Turned and Polished Shafting . . . Turned and Ground Shafting . . . Wide Flats up to 12" x 2".
COMPLETE ANNEALING AND HEAT TREATING FACILITIES

Production Doubled Costs Reduced SPEED CASE STEEL

A LOW CARBON OPEN HEARTH PRODUCT..

INCREASED PRODUCTION

- Fast Machinability
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- Reduced Material Costs

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Speed Case replaced a SAE 3115 steel, resulting in parts of equal excellence. Material costs reduced 50%, production increased 100% due to the excellent machinability and satisfactory response to heat treatment of Speed Case Steel.

Estimated savings per ton of Speed Case used, $73.65.

Write for SPEED CASE CATALOG. Actual shop records show savings of 20 to 65%.

OUR METALLURGISTS ARE AT YOUR SERVICE

If you wrote your own specifications for the ideal, all purpose, open hearth carburizing STEEL, it would be . . . SPEED CASE!

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MANUFACTURERS OF COLD FINISHED CARBON AND ALLOY STEEL BARS

HOW TO WELD

—basic principles

—step-by-step procedures

—special techniques

Eliminate hours of needless trial-and-error learning by using the methods of experienced welders presented in this new book. Here, in simple everyday language, are the basic step-by-step procedures for making any kind of weld. Let this book help you save time and avoid errors by showing you how to use correct technique from the very beginning.

Just Published!

Arc and Acetylene Welding

By HARRY KERWIN

Formerly of California Polytechnic School, San Luis Obispo, California

240 pages, 201 illustrations, $2.50

This practical manual covers the whole field of welding to give you a thorough working knowledge of up-to-date methods used in shipyard, aircraft, pipe line, and general maintenance work. It gives you workable methods for controlling expansion and contraction of metals, shows you how to test weld samples, thoroughly explains difficult techniques for arc welding of cast iron, low heat brazing, etc. This is a book to provide the beginner with a complete training in practical welding processes—aid the advanced welder who wishes to add special fields to his knowledge.

Practical—Tested

● Used in the author's welding classes, this method has been found to shorten training time in most cases by as much as fifty percent.

GIVES YOU PRACTICAL TECHNIQUES FOR:

—making an edge weld
—making a weld in the vertical position
—making a tube cluster weld
—welding stainless steel
—making a single-pass weaving-bead vertical fillet
—cutting with the arc
—making a rolling pipe butt weld
—making a T, or saddle, weld
—making an angle weld
—striking the arc and running a bead in the flat position
—constructing a pattern layout
—making a penetration bead on a flat plate
—making a flat fillet weld in three passes
—making a vertical butt weld with weaving beads, with stringer beads, and with a backup strip

CHAPTERS

ACETYLENE WELDING

The Weld. Welding Equipment. Preparation for Welding. Basic Practice Plates. Aircraft Welding. Final Test Plates of Army and Navy A Test. Pipe Welding. Forehand and Lindewald Technique. Identification of Metals. Expansion and Contraction. Cast-iron Welding and Cutting. Hard Facing and Alloy Welding. Brazing. Tables. Safety Rules.

ARC WELDING

The Welding Machine and Its Care. The Electrode. Wearing Apparel. The Welding Booth and Welding Bench. Beading Technique. Expansion and Contraction. Cast-iron Welding. Aluminum Welding. Building Up and Hard Facing. Testing Weld Samples.

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OXYGEN REGULATOR
Engineers specify . . .

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DIE CASTINGS

There is a definite advantage to our military fliers when they can take to the oxygen rare altitudes, and dive down at enemy aircraft. But there is a vital problem, too. They must have an oxygen supply delicately timed to prevent "blacking out" in the stratosphere or an "oxygen jag" at low levels. What they need — and have — is an automatic Demand Oxygen Regulator which "does its own thinking."

Here is proof of the adaptability of Auto-Lite die castings to the most exacting instrument construction. In the case of the Oxygen Regulator limits of one ten-thousandths of an inch are secured in final finish. "Controlled Metals" result from such practices as spectrographic analysis, metallographic studies, physical testing, x-ray inspection and heat treating. Write us about your problem today.

THE ELECTRIC AUTO-LITE COMPANY
Alemite Die Casting Division
WOODSTOCK, ILLINOIS

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TUNE IN AUTO-LITE'S RADIO SHOW "EVERYTHING FOR THE BOYS"—EVERY TUESDAY NIGHT—NBC NETWORK

AMERICAN Phillips SCREWS

Put the Screws on the Enemy...BUY BONDS!

give you TOP SPEED with Controlled ACCURACY

Enabling you to:—

STOP *waste of time*

There's no fumbling or dropping, with American Phillips Screws. And no wobbly starts, for the recessed screwhead fits firmly onto the 4-winged driver, like a fixed bayonet onto a gun. Power drivers can be used, increasing assembly-speed often as much as 50%.

STOP *rejections*

"Controlled Accuracy" means that American Phillips Screws and driver align themselves automatically into one straight-line unit *that can't drive crooked and spoil work.* Nor can the driver ever twist out and slash across the work-surface.

STOP *scrapping of screws*

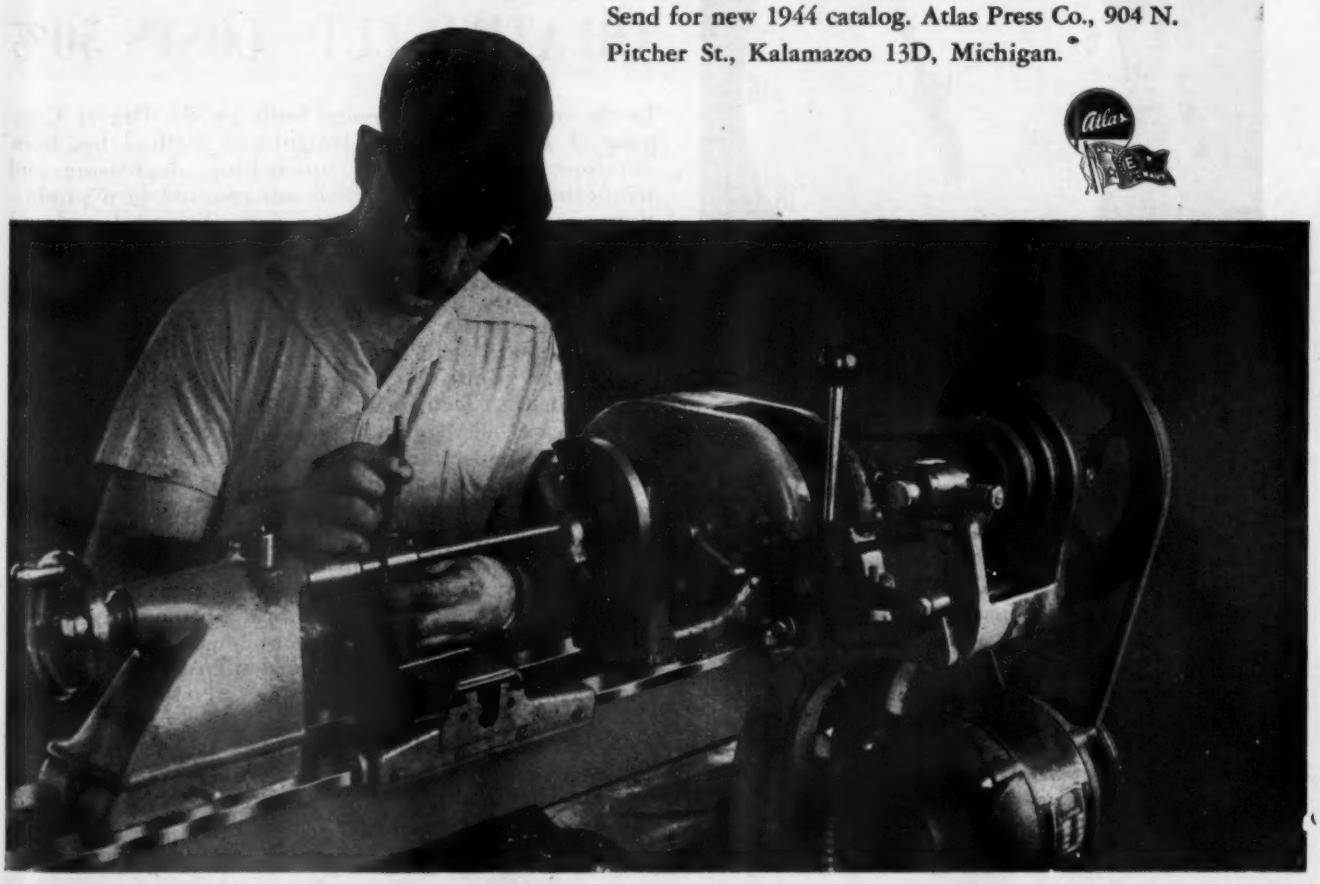
American Phillips Screws can't be burred or broken like slotted-screwheads. And American Phillips Screws don't have to be backed out and thrown away. Nor do they have to be scrapped for defects of head, thread, or point . . . thanks to American's individual inspection.

AMERICAN SCREW CO. Providence 1, R. I. Chicago 11: 589 E. Illinois St. Detroit 2: 502 Stephenson Bldg.

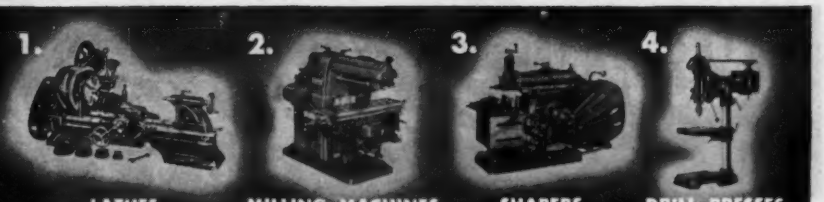
Atlas 10" LATHES

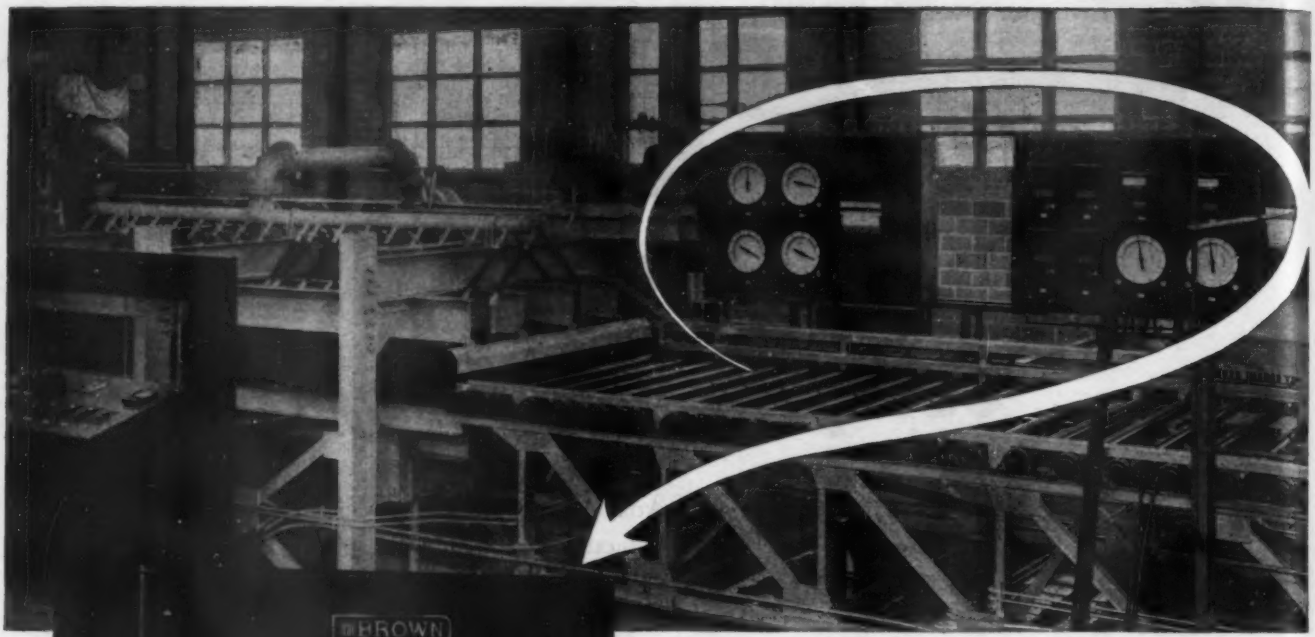
Compact and Capable

The performance record of Atlas 10" lathes in thousands of war plants forecasts a new advance in production engineering for peace. Today, these compact, capable machines are delivering precision work formerly entrusted only to larger, far more expensive equipment. Production records show that Atlas lathes and other tools handle most small parts machining operations much more efficiently and economically than the larger machines. If your postwar production plans call for operating flexibility, low machine-hour costs, and inexpensive machine investment, get the data on Atlas. Send for new 1944 catalog. Atlas Press Co., 904 N. Pitcher St., Kalamazoo 13D, Michigan.



Atlas 4 TOOL TEAM FOR SMALL-PARTS MACHINING





Instrument Panel Board Shows Brown Electronik Potentiometers Installed on the Drever Continuous Type Furnace.

Balance Must Be Continuous

The Brown *Electronik* Potentiometer is the only potentiometer-type instrument in which the air control flapper mechanism is continually positioned in response to temperature changes. The Brown *Electronik* Potentiometer Pyrometer uses no galvanometer or periodic type of balancing mechanism. It brings to industry an advanced and practical application of electronics and *"Continuous Balance"* Method of temperature measurement. The Brown *Electronik* Potentiometer makes it possible to take full advantage of thermocouple responsiveness and thereby reduces to zero the effects of instrument lags caused by delays in detection and valve positioning.

STRAIGHT-LINE HEAT TREATING CUTS COSTS 50%

In the operation of furnaces built by the Drever Company of Philadelphia, a straight-line method has been developed for hardening, quenching, degreasing and tempering armor plate which has resulted in a production speed-up, improvement of quality and reduced manufacturing costs as much as 50% in the production of 1/8" and 1/4" plate.

Playing an important part in this improved technique developed by the Drever Company are Brown *Electronik* Potentiometer Controllers which maintain exact temperature control of the entire heat-treating process.

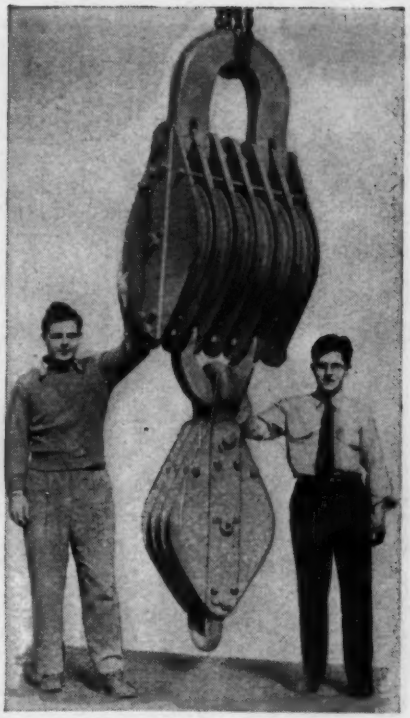
The Brown *Electronik* Potentiometer is sensitive to an unbalance of .06% of scale span on all ranges offered. Its speed of response moves the pen 1% of chart in 1/5 of a second, or at the rate of 14 1/4" per minute. Overall accuracy of the Brown *Electronik* Potentiometer is 1/4 of 1% of scale span. It is built to withstand severe plant service—its fundamental principle and simple construction make it vibration-proof. Wear is reduced to a minimum because there is no mechanical motion except when the temperature changes. Interchangeable with your present potentiometers—utilizes standard thermocouples and wiring.

For full details write for Bulletin 15-4. The Brown Instrument Company, *a division of Minneapolis-Honeywell Regulator Company*, 4501 Wayne Avenue, Philadelphia 44, Pennsylvania. Offices in all principal cities. 119 Peter Street, Toronto, Canada—Wadsworth Road, Perivale, Middlesex, England—Nybrokajen 7, Stockholm, Sweden.

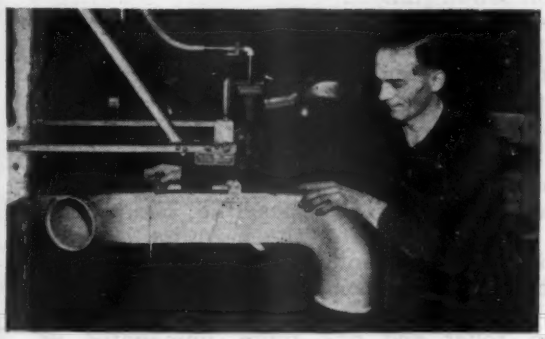
BROWN *Electronik* POTENTIOMETERS

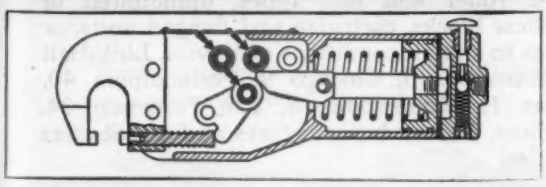
IN THE NEWS
WITH TORRINGTON BEARINGS

ALL IN THE DAY'S WORK typifies the attitude of Torrington engineers when they undertake the design and manufacture of anti-friction bearings for new or unusual applications. The skilled workman shown in the illustration is grinding the race for a precision bearing 10 feet in diameter, with a tolerance of two-thousandths of an inch. When you need counsel on standard or large, custom-built bearings, TURN TO TORRINGTON.

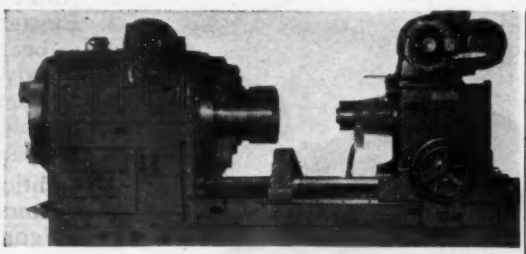


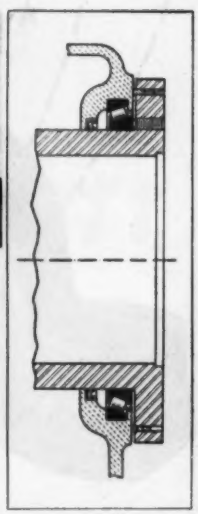
LIFTING 125-TON LOADS is the job of these tackle blocks designed and built by the Downs Crane & Hoist Company. With one block employing six sheaves, the other three, they are used in tandem to reeve the 19 parts of one inch wire rope required to sustain the load. Two NCS Needle Bearings, supplied by Torrington's Bantam Bearings Division, were installed in each of the sheaves which revolve on a 3" hardened and ground shaft, with the pin hollow bored for pressure lubrication. NCS Needle Bearings combine the advantage of high load capacity and compact design with ease of installation.





THIS CINCINNATI PNEUMATIC Squeeze Type Riveter, with a 3-ton compressive force, manufactured by the Schauer Machine Company, provides an interesting application for Torrington LN Needle Bearings. Selected because of their compact design and high load capacity, the bearings were installed, as shown in the accompanying cross-section, at the points where pressure is extremely high.





MILLING THREADS in 8" howitzers and 155 mm. guns is part of the important work performed by this Master Thread Miller, manufactured by the Smalley-General Company. To provide the essential accuracy at high speeds, and to take up the very heavy radial and thrust loads, both main and milling spindles are mounted in Tapered Roller Bearings, 30" O.D., as shown in the accompanying cross-section. Eccentricity and face run-out of these bearings is .0005 maximum—an example of the ability of Torrington's Bantam Bearings Division to build precision bearings for heavy-duty applications.

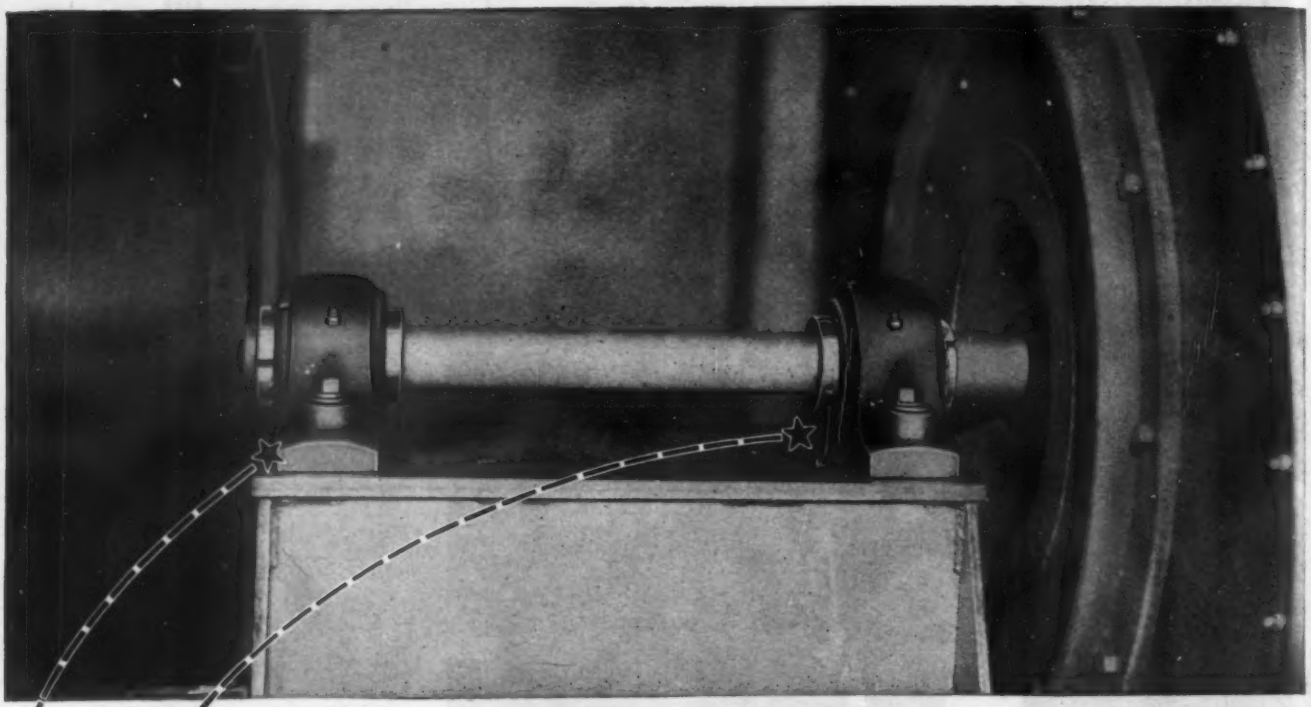
ARMY E NAVY

TORRINGTON BEARINGS

STRAIGHT ROLLER • TAPERED ROLLER • NEEDLE • BALL

THE TORRINGTON COMPANY • BANTAM BEARINGS DIVISION

SOUTH BEND 21, INDIANA



Industrial Gas Engineering Company's high temperature fan, equipped with Link-Belt Friction Fighter roller bearing pillow blocks. Note that the bearing supports are merely rolled shapes.

Star Performance Assured

These essential features are combined in the design and construction of Friction Fighter bearings:

1. Radial-thrust roller bearing capacity.
2. Anti-Friction self-alignment.
3. Efficient sealing provides full protection from time bearing leaves factory.
4. Sturdy, compact, streamlined housing requires minimum support space.
5. Simple, economical installation.
6. Requires minimum attention.

In addition to assuring highly efficient bearing performance under all operating conditions, the anti-friction self-alignment feature eliminates the need for extreme accuracy in alignment of mounting surfaces, allowing full advantage to be taken of economical manufacturing practices. Friction Fighter bearings are obtainable in a wide range of sizes, roller and ball types, unmounted or mounted in pillow blocks, cartridge and flanged units, or other mountings to suit all conditions of service. Link-Belt Company, Indianapolis 6, Chicago 9, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Toronto 8. Offices, factory branch stores and distributors in principal cities.

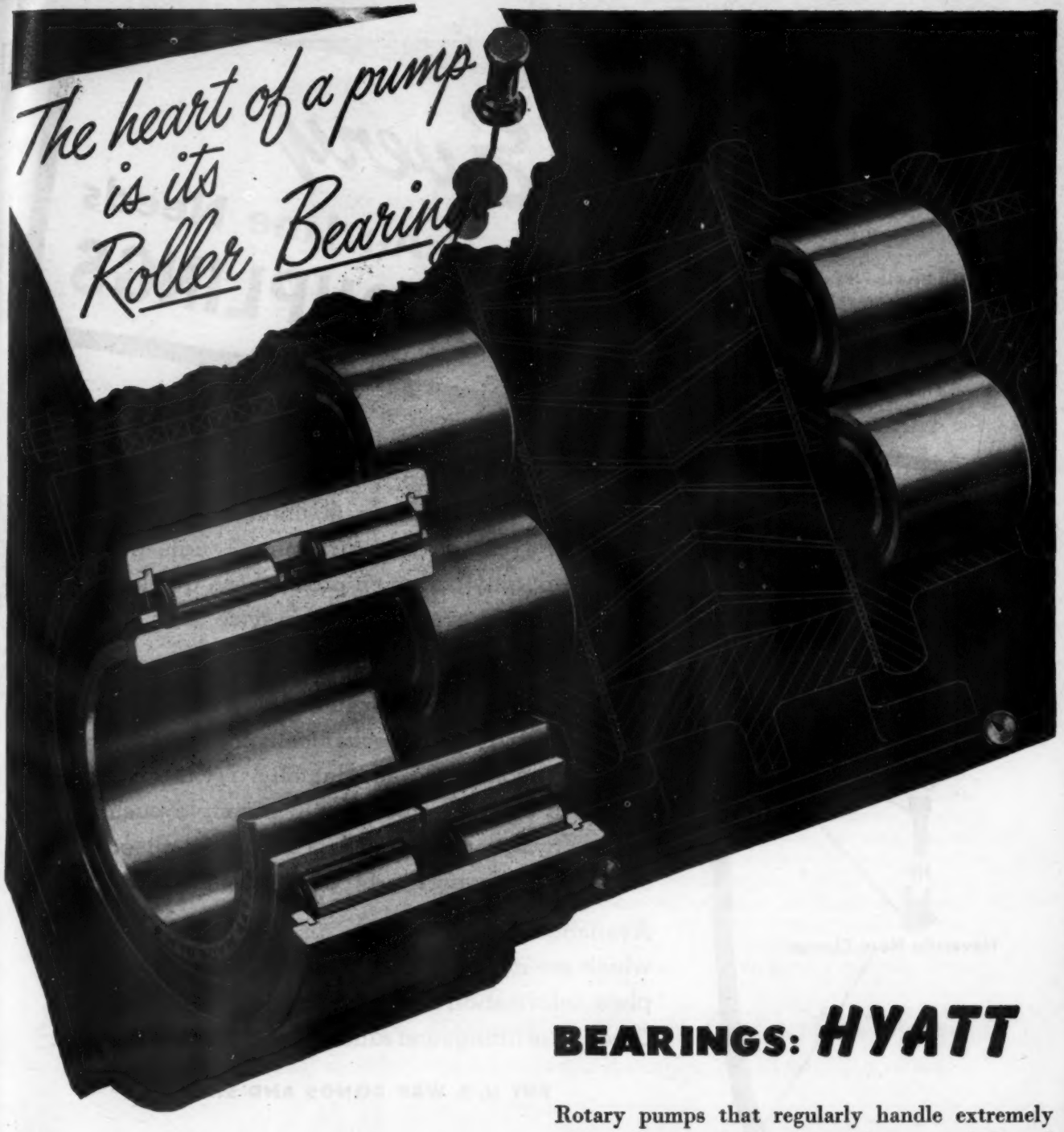
LINK-BELT

FRICTION FIGHTER

BEARINGS

Roller and Ball Types

The heart of a pump is its Roller Bearing



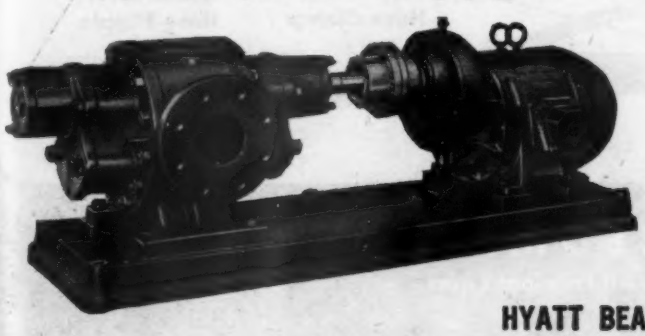
BEARINGS: *HYATT*

Rotary pumps that regularly handle extremely viscous liquids such as tar, molasses, asphalt and rosin, as well as liquids having lubricating value, for top efficiency must have roller bearings of large capacity and long life.

The selection of Hyatt Roller Bearings indicates that the manufacturer has done the utmost to assure the maximum of pump performance.

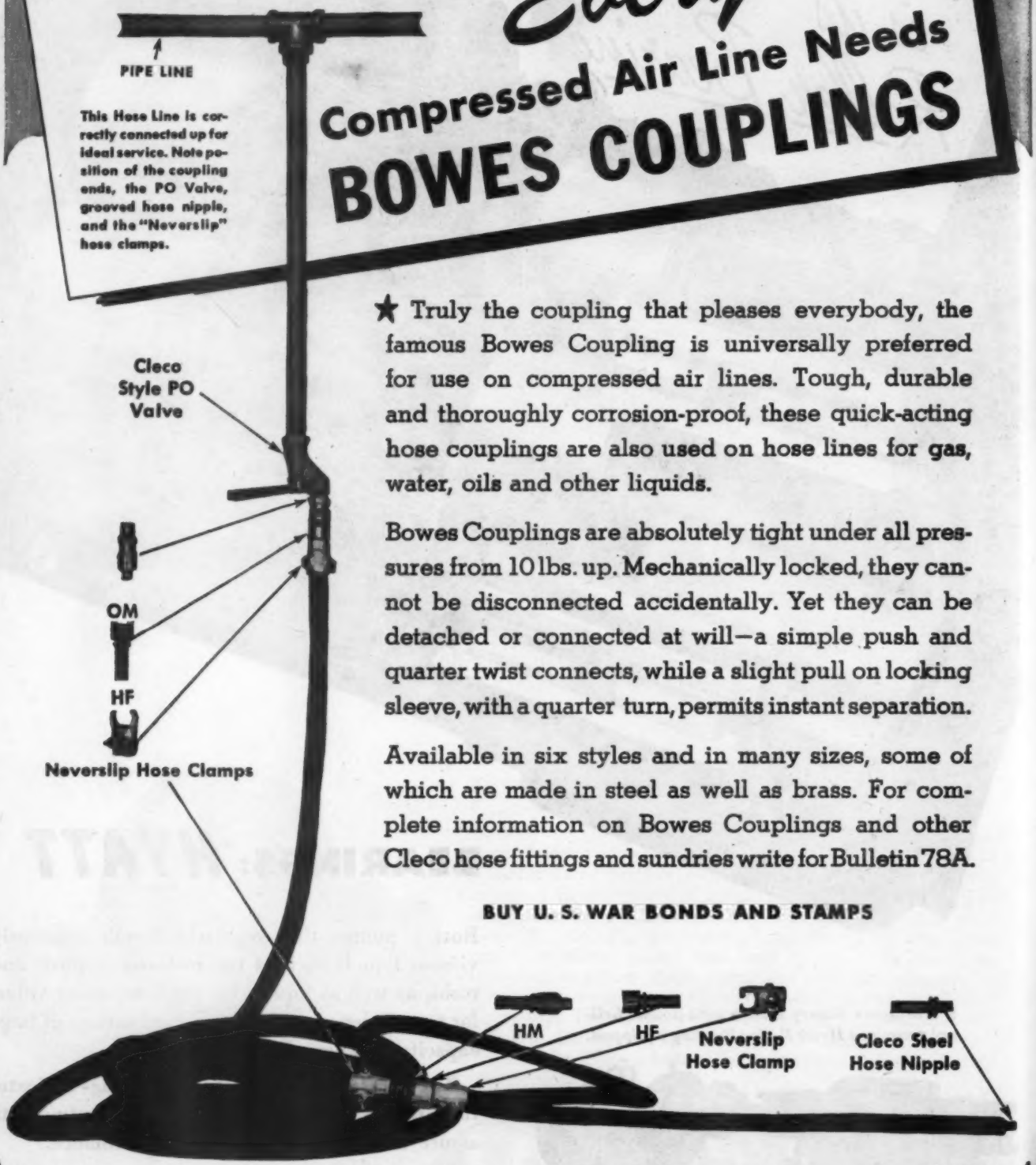
Whatever your bearing problem may be, call on Hyatt engineers. They bring much valuable help to you.

Worthington Rotary Pumps with double helical gears are Hyatt Roller Bearing equipped.



HYATT BEARINGS Division of GENERAL MOTORS CORPORATION
Harrison, New Jersey

Every Compressed Air Line Needs BOWES COUPLINGS


PIPE LINE
This Hose Line is correctly connected up for ideal service. Note position of the coupling ends, the PO Valve, grooved hose nipple, and the "Neverslip" hose clamps.
Cleco Style PO Valve
OM
HF
Neverslip Hose Clamps
HM
HF
Neverslip Hose Clamp
Cleco Steel Hose Nipple

★ Truly the coupling that pleases everybody, the famous Bowes Coupling is universally preferred for use on compressed air lines. Tough, durable and thoroughly corrosion-proof, these quick-acting hose couplings are also used on hose lines for gas, water, oils and other liquids.

Bowes Couplings are absolutely tight under all pressures from 10 lbs. up. Mechanically locked, they cannot be disconnected accidentally. Yet they can be detached or connected at will—a simple push and quarter twist connects, while a slight pull on locking sleeve, with a quarter turn, permits instant separation.

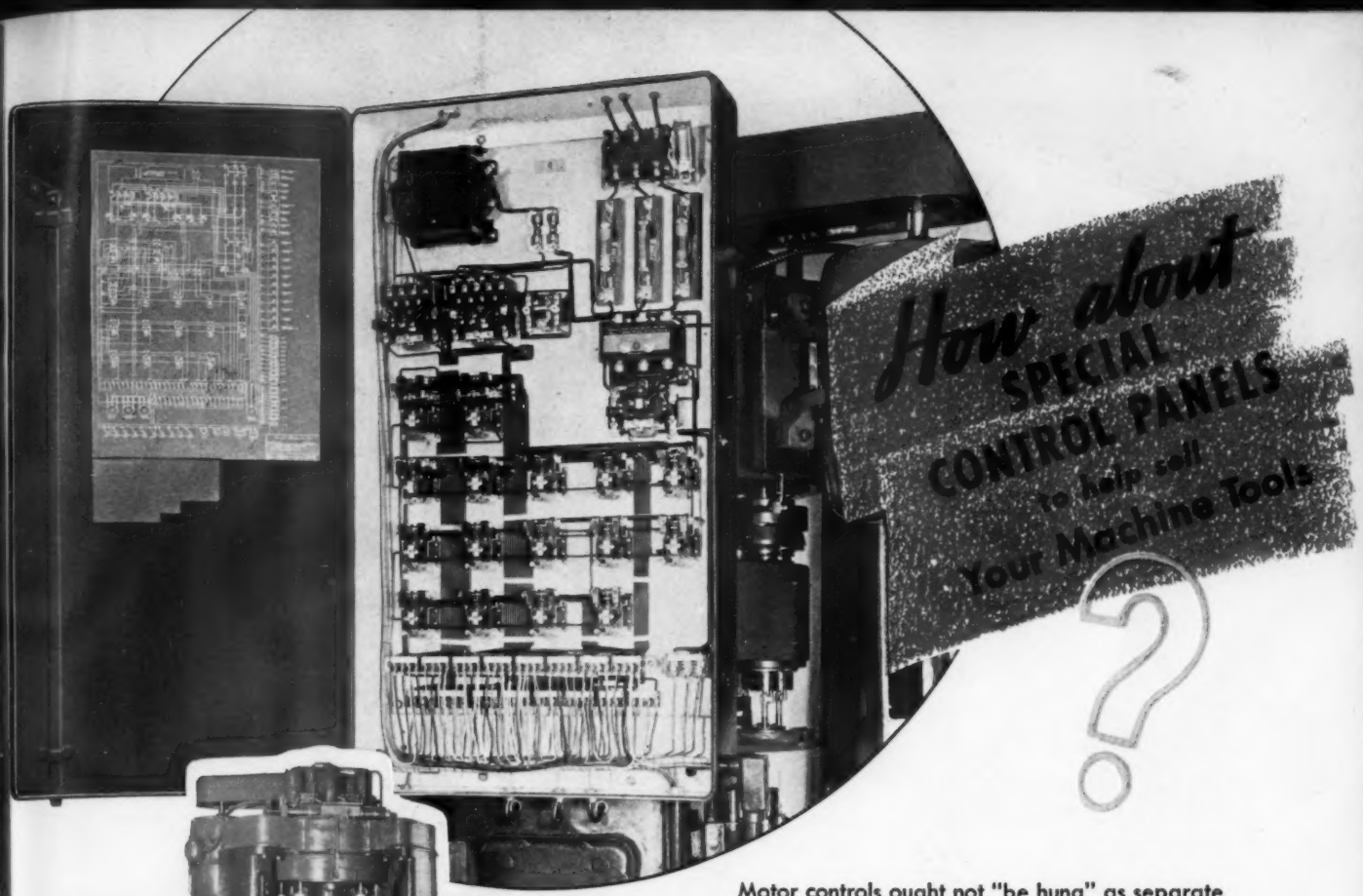
Available in six styles and in many sizes, some of which are made in steel as well as brass. For complete information on Bowes Couplings and other Cleco hose fittings and sundries write for Bulletin 78A.

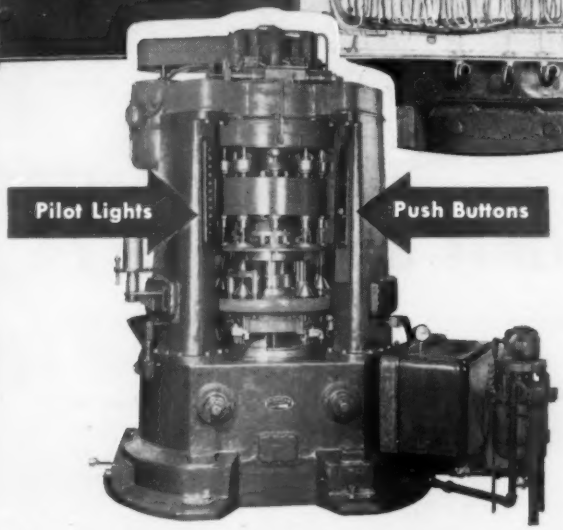
BUY U. S. WAR BONDS AND STAMPS

THE CLEVELAND PNEUMATIC TOOL CO.

3781 EAST 77th ST. *Branch Offices in All Principal Cities* CLEVELAND, OHIO

★





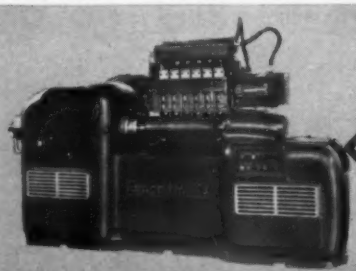
Motor controls ought not "be hung" as separate items on your "up-to-date" machine tool—as an afterthought. Instead, give yourself the sales advantage of complete control assembly . . . like the panel shown above . . . designed to your special requirements, but assembled from standard parts by Allen-Bradley. The appearance of your machine will be improved—its correct sequence operation will be assured, because the panel will be correctly "wired" by specialists.

Allen-Bradley engineers will gladly study your control needs and submit a panel layout for your consideration. Write, today!

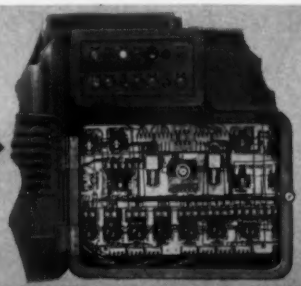
Allen-Bradley Company, 1316 S. Second St., Milwaukee 4, Wis.

Leading Machine Tool Builders Use A-B Control Panels

built to their individual specifications from standard starters, contactors, and relays



This lathe, made by the Cross Co., is a typical example of a modern machine tool with the Allen-Bradley control panel built into the machine base. Note also the neat push button and pilot light control board above panel.



ALLEN-BRADLEY

SOLENOID MOTOR CONTROL

QUALITY

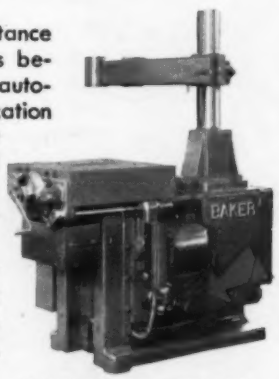
Right and Wrong Ways to use limit switches. A handy guide for designers of motorized machines.

Do you use enough LIMIT SWITCHES?

Here is a 24-page data book on limit switches . . . and how to apply them

Limit switches are growing in importance to machinery designers and builders because of the demand for completely automatic sequence operation. The application requirements are so diversified that the Allen-Bradley line lists several hundred different types . . . each one adapted to meet the needs of a particular machine or duty cycle.

The whole story of Allen-Bradley limit switches, and how to select and install them, is told in the 24-page data book known as Bulletin 801-802.



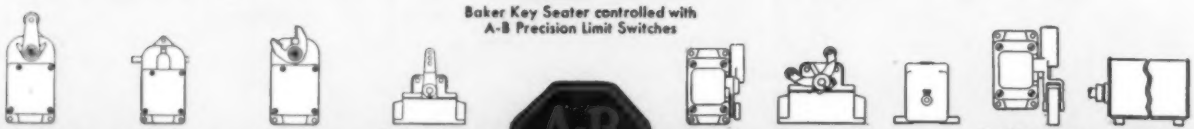
Baker Key Seater controlled with A-B Precision Limit Switches

It is a gold mine of information on hundreds of varieties of limit switches. It also contains a special section on "Right" and "Wrong" ways to install limit switches.

Have you considered the possibilities of limit switch control on your machines or equipment?

If not, let one of our specialists check your machines for possible improvements with limit switch control.

Or, send for Bulletin 801-802.



ALLEN-BRADLEY

LIMIT SWITCHES FOR EVERY SERVICE

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ENDING THE TERROR OF LOW FLYING ENEMY AIRCRAFT

The "Water Buffalo", amphibious tank combining firepower, speed and mobility Made by Food Machinery Corp. Uses armor plate supplied by Atkins.

The M-17 multiple-motor carriage, made by International Harvester Co. Armor plate made by Atkins. Other similar military vehicles are equipped with Atkins One-Man Crosscut Saws.

How the Same Skills Used in Making Saws for You HELP PROTECT OUR FIGHTERS

Thanks to superior weapons mounted on highly mobile vehicles and protected by superior armor plate, most of the sting of low flying aircraft, once the enemy's favorite weapon of terror, has been removed.

The manufacturer of life-saving armor plate for these and other weapons was one of the major tasks assigned to Atkins early in this war. In fact, Atkins was supplying it to the Netherland East Indies as far back as the Fall of 1939. But the special skills required in its production date back much farther. These skills are the culmination of over eight decades of extensive experience in the heat treatment and fabrication of metals.

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ALLOY STEELS FOR VICTORY

Scientifically selected to conserve critical alloys and meet the requirements of the AIRCRAFT, ORDNANCE, and MACHINE TOOL industries.

Complete "EARMARKED" stocks of Aircraft alloy steels at Buffalo and Detroit.

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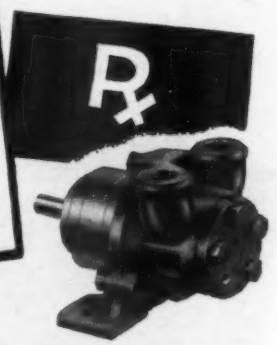

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Tuthill internal gear rotary pumps are available in sizes from 1 to 200 g.p.m. and pressures up to 400 p.s.i. Wide choice of porting and mounting. Write for general catalog.

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KEEP PACE WITH PROGRESS

The Howell Protected Type Motor, shown, gives complete protection against dripping liquids, metal chips and other falling particles. Completely streamlined — utilizing non-breakable steel frame — malleable or steel base — cast iron end plates and cast iron, weatherproof terminal box are standard construction features. Special horizontal and vertical mountings are available.

Available in sizes 5 H.P. and smaller.

ELECTRICIAN: What are *you* doing here?

HORSE: I'm going to give you a tip—going to steer you straight to the best buy in electric motors.

ELECTRICIAN: We've been buying motors from the same firm for 17 years —we know motors.

HORSE: That's just it. A lot of improvements have been made since you first investigated motors. Take Howells, for example. All our motors are precision-built—many of them are specially built for the job they are to do. Today, we're building specialized motors for machine tools, ventilating fans, air conditioning equipment, dairy work, almost every job you can name. And Howell Motors are doing these jobs at lower costs and with less trouble.

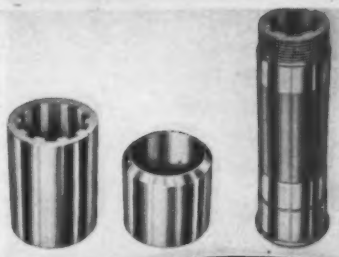
ELECTRICIAN: You mean you will furnish specialized motors for my job? Why, I thought I had to take standard motors! I guess I better keep pace with progress.

Get acquainted with Howell Motors now. Phone the nearest Howell representative or write direct to the factory.

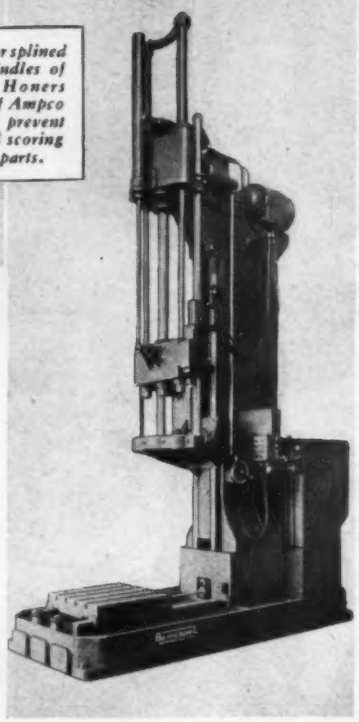
HOWELL ELECTRIC MOTORS COMPANY

HOWELL, MICHIGAN

Manufacturers of Quality Motors Since 1915



Bushings for splined driving spindles of Barnesdril Honers are made of Ampco Metal, to prevent galling and scoring of mating parts.



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. . with parts of wear-resisting Ampco Metal

Like other leading makes of machine tools, Barnesdril Hydraulically Reciprocated Honing Machines are guarded against breakdowns at critical points with parts of Ampco Metal, a superior alloy of the aluminum bronze class that lasts several times as long as ordinary bronzes. Adopted by over 90 leading machine tool makers where they need exceptional strength, hardness, and resistance to wear, shock, and fatigue. Check for parts of Ampco Metal, as a mark of quality in the machines you buy. And replace worn parts of your older machines with durable Ampco. Write for File 41 of Engineering Data Sheets. M-9

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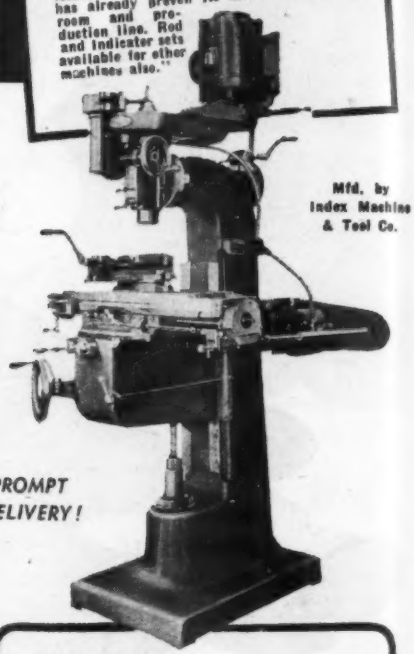
AMPCO Metal
The Metal without an Equal

NOW! INDEX MILLS EQUIPPED WITH RODS & INDICATORS

"We are pleased to announce a rod and indicator set available for installation on Index Mills, either new at the factory, or used machines already in the field. Set consists of two indicators graduated in .0001" two micrometer heads graduated in .0001", necessary precision rods for locating in an area 8" x 16", and troughs for holding rods cross and longitudinal. This makes it possible for you to obtain, at an astonishingly low price, a precision locator as well as a vertical mill which has already proven its merits in the tool room and production line. Rod and indicator sets available for other machines also."



Mfd. by Index Machine & Tool Co.

PROMPT DELIVERY!

12" Tool Room Rotary Table

Mfd. by Index Machine & Tool Co.

A quality tool for precision work in the tool room or production line, incorporating such features as ball bearings—hardened and ground worm—quick acting throw-out for free hand turning—single movement table lock that does not cramp table out of alignment—compound trough. 12" size only.

For use on Index Mills or any other machine that will accommodate a 12" table.

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Says Mr. R. Aramiam, Fleet Supt., Roosevelt Cartage Co., Chicago, Ill.

Like 95% of the operators of more than 100,000 motor vehicles recently surveyed, Mr. Aramiam says he "would more than welcome a dependable self-locking nut—a nut that *can't* shake loose."

Once tight, the Boots Nut *stays* tight. Its built-in lock holds an unshakable grip—will never loosen, until you take off the nut for use again. Being 100% metal, Boots are not affected by oil, gasoline, heat or cold.

Prominent fleet operators like R. H. Macy & Co., Metropolitan Distributors, Inc., United Parcel Service and others have tested the Boots Nut over many months and *proved* how effectively it eliminates need for re-tightening.

The Boots Nut was developed and first put into production in 1942. Since no design changes are necessary for its use, you can expect Boots protection on even the *first* post-war models of trucks, buses and passenger cars.

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I PREDICT...

by Morris Sanders

Industrial Designer of New York

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* * *

NOTE: The Weatherhead Company, one of the oldest and most important manufacturers of parts for the refrigeration industry, is prepared for the day when its four plants will be contributing as actively in peace as it has in war to the country's refrigeration needs.

Look Ahead with

Weatherhead

THE WEATHERHEAD COMPANY, CLEVELAND, OHIO

Manufacturers of vital parts for the automotive, aviation, refrigeration and other key industries.

Plants: Cleveland, Columbia City, Ind., Los Angeles
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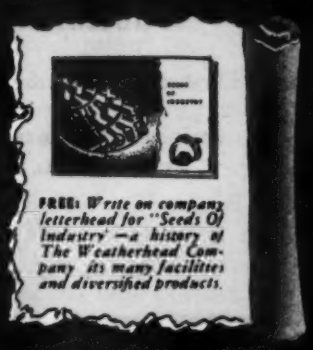

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FROM 6" INSIDE DIAMETER TO 100" OUTSIDE DIAMETER
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to unusual accuracy in large diameters

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THE KAYDON ENGINEERING CORP.

For excellence in production of extremely precise, unusually large ball and roller bearings

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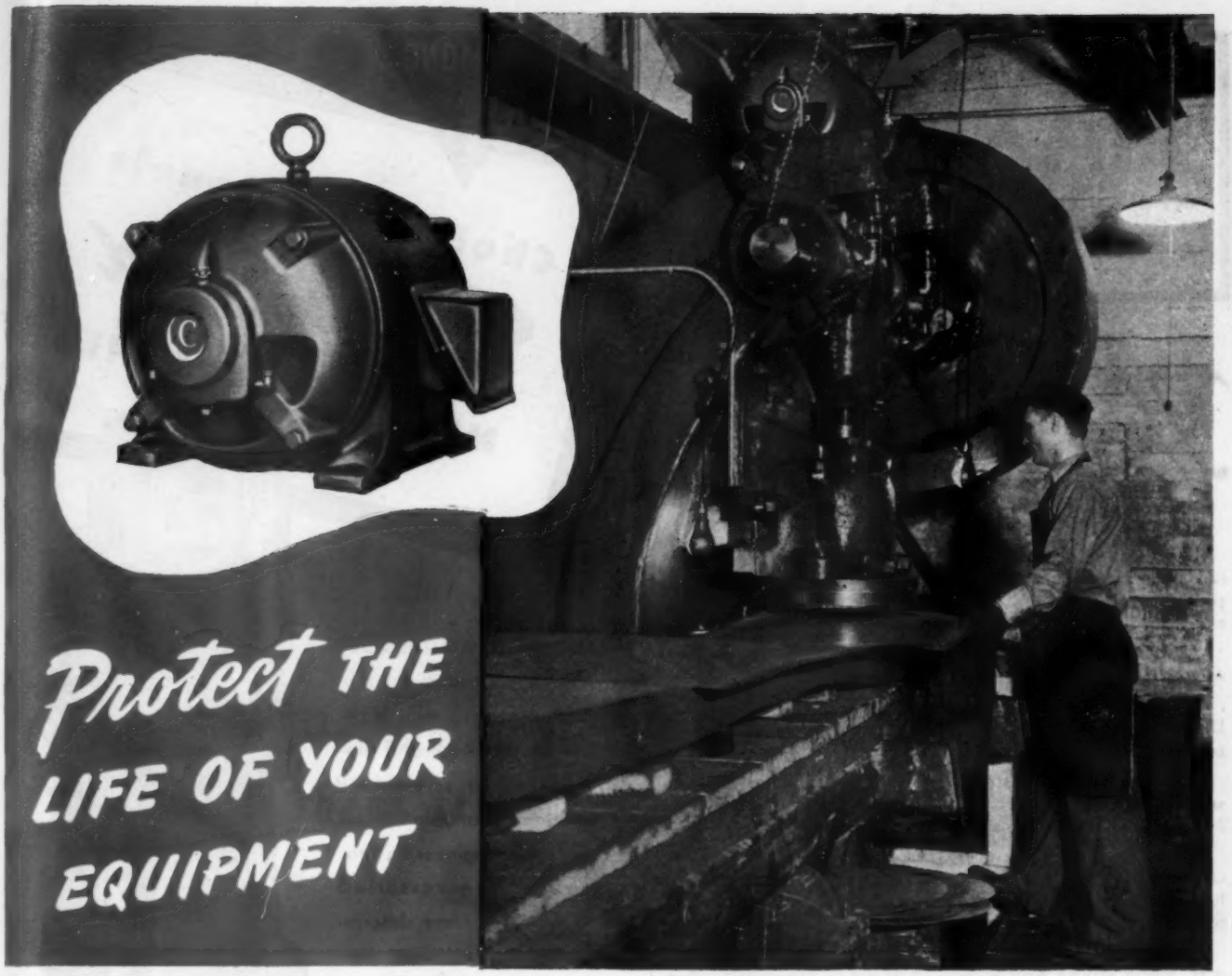

AGAINST THE WEAR and TEAR of SHOCK LOADS

With Century Type SCT High Torque, High Slip Motors

On such applications as punch presses and shearing machines, Century Type SCT high torque, high slip motors will add extra life to the equipment.

These motors reduce the shock to your equipment by cushioning the impact when the load comes on. As the peak load on the machine comes on, the motor speed is pulled down. The load cycle is completed by using the energy stored in the flywheel.

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To get complete information on these and other advantages of Century motors, call in a Century engineer. He'll study your problems, consider the type of load, the protection from surrounding atmospheric conditions, and recommend the Century motor best suited to your installation.

Century C MOTORS

CENTURY ELECTRIC COMPANY

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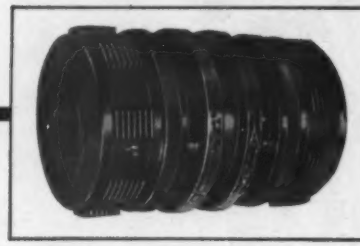
Offices and Stock Points in Principal Cities

"MAXITORQ"



The FLOATING DISC CLUTCH . . .

Built for superior clutch operation, the **"MAXITORQ"** can be depended upon for duties where fast, smooth power pick-up is essential . . . where instant automatic release on overload is a vital requirement.

In addition, **MANUAL INSTALLATION — ASSEMBLY** and **ADJUSTMENTS** are made without the use of tools.

The patented features of the **"MAXITORQ"** Floating Disc Clutch principle include progressive developments that out-feature any similarly designed clutch.

All discs ride free of each other in neutral — you can see between them. No chance of re-engagement . . . no chance for drag and the consequent abrasion and heat.

Both wet and dry types are available, the former consisting of hardened and ground steel discs to be run in a lubricant, the latter of alternate discs of steel and self-lubricating bronze.

Clutch engagement is easily controlled by light pressure. Sleeve groove wear is reduced by use of non-metallic shoes.

SINGLE CLUTCH TYPE

Made in both single and double clutches in capacities from ¼ to 5 H.P. at 100 R.P.M. Also in Pulley and Cut-off Coupling types.

New Catalog No. 4 on request. The Carlyle Johnson Machine Company, 52 Main Street, Manchester, Conn.

The **CARLYLE JOHNSON MACHINE COMPANY**
MANCHESTER, CONNECTICUT

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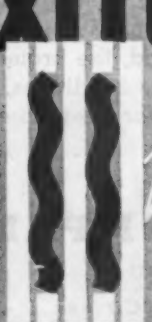
MAXITORQ floating DISC CLUTCH

You can see between the discs



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DIAMOND TOOL CO. L.A.

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THREE MODELS for high production—tool room or bench milling requirements. Rack and pinion feed or screw feed optional. Available with all desirable engineering features and accessories. Write for folders describing Diamond Milling Machines by model number.

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Thus the continuous flow of materials, made possible by "AUTOMATIC" Tiering Fork Trucks, insures fast, low-cost, daily handling which helps materially to speed up operations. . . . Find out just how you can apply the "AUTOMATIC" Tiering Fork Truck to your handling needs — write today.

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WHY BURDEN YOUR POST-WAR PRODUCT WITH NEEDLESS TAPPING COSTS!

...USE *The Short-Cut Method!*

Let the P-K Assembly Engineer show you how to take out tapping and put in PROFITS. The *Short-cut* fastening method, with Parker-Kalon Self-tapping Screws, eliminates the tapping and tap expense of machine screw fastenings. On many jobs, this means savings in assembly time and labor of from 30% to 50%.

You can make similar savings when you use P-K Screws to replace slow bolt-and-nut fastenings, troublesome inserts in plastics, riveting in hard-to-reach places. One operation makes a fastening with a P-K Screw. You just drive it into a plain, untapped hole. Truly a short-cut method! It makes a stronger fastening, too.

Before your post-war assembly practices are set up, talk over your fastening problems with a P-K Assembly Engineer. You'll find his recommendations unbiased. He'll suggest P-K Screws only when they will save time, lower costs, provide stronger fastenings. No matter what kind of material you are working with—light or heavy steel, cast iron, aluminum, brass, or plastics—you'll find you can adopt P-K Screws to advantage in 7 out of 10 cases.

No special tools or skilled help are required. You can switch to P-K Screws overnight.

GET THIS GUIDE—

TO HELP YOU PLAN POST-WAR ASSEMBLIES, Parker-Kalon has prepared a handy "Users' Guide", giving information you need on all types of P-K Self-tapping Screws. It is arranged so you can find facts quickly, and made file size, with a hanger for use as a wall chart. Write for your copy. Parker-Kalon Corp., 208 Varick St., New York 14, N. Y.

SELF TAPPING SCREWS FOR EVERY METAL AND PLASTIC ASSEMBLY

PARKER-KALON
Quality-Controlled
SELF-TAPPING SCREWS

COSTLY REPAIRS STOPPED BY DAYTON V-BELT DISTRIBUTORS

A Typical Example!

With the drive formerly used on this 75-ton automatic header, the bearings of the header and motor were punished so severely that the machine had to be frequently torn down and repaired.

A telephone call brought a Dayton V-Belt Distributor who made a study of the drive and recommended conversion to Dayton V-Belts. Seven belts were used with 11" drive pulley and 52" driven pulley . . . 45" center to center.

The Dayton V-Belt drive is now operating 20 hours a day and there are no worn bearings—no costly shut-downs and repairs.

Call Your Distributor for This Expert Service by Factory-Trained Men

No matter what your drive problems may be, it will pay you to phone your local Dayton V-Belt Distributor. Without obligation he will send a factory-trained Dayton V-Belt expert to study your drive. Ninety-nine chances in a hundred, the drive can be quickly converted to smooth-running, hard-gripping, long-lasting Dayton V-Belts—anything from fractional to a thousand horsepower. Then your troubles will be over.

Always remember that Dayton Rubber has more than 30 years' experience in building V-Belts of natural and synthetic rubber, and today, is the world's largest V-Belt manufacturer. Depend on Dayton V-Belts for the best and most economical performance—and depend on your Dayton V-Belt Distributor for the utmost in prompt, expert service

CALL YOUR DAYTON V-BELT DISTRIBUTOR OR WRITE DIRECT

THE DAYTON RUBBER MFG. CO.
The World's Largest Manufacturer of V-Belts
DAYTON 1, OHIO
Dayton Rubber Export Corporation
38 Pearl St., New York, N. Y., U. S. A.
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MAINTAIN VICTORY SPEEDS—CONSERVE YOUR TIRES

V-Belts by Dayton Rubber

REG. TRADE MARK THE DAYTON RUBBER MFG. CO.

The Mark of Technical Excellence in Synthetic Rubber

CHECK THE FEATURES YOU WANT IN A WORK-BENCH .. YOU'LL FIND THEM ALL IN HALLOWELL

SHOP EQUIPMENT of STEEL

RIGHT SIZE

"Hallowell" ready-made Work-Benches are made in five heights and widths and in seven standard lengths from 3 to 10 feet. Any number can be joined end to end for a continuous work-bench. 1367 combinations available.

CONVENIENCE

Pilfer-proof drawer units, shelves, cabinets, etc., are available to make the benches fit the job. Prices and deliveries are right.

STURDY CONSTRUCTION

Constructed for long wear and made to stand firm and rigid without costly, time-taking bolting to the floor.

"Hallowell" Steel Stool—Dished, wooden Seat 14½" dia. Heights: 14" to 36" incl., stepped up by 2" Adjustable Spring Posture Back. Welded throughout. Finish: Rich Olive Green Enamel. Get Bulletin.

STANDARD PRESSED STEEL CO.

JENKINTOWN, PENNA. BOX 4

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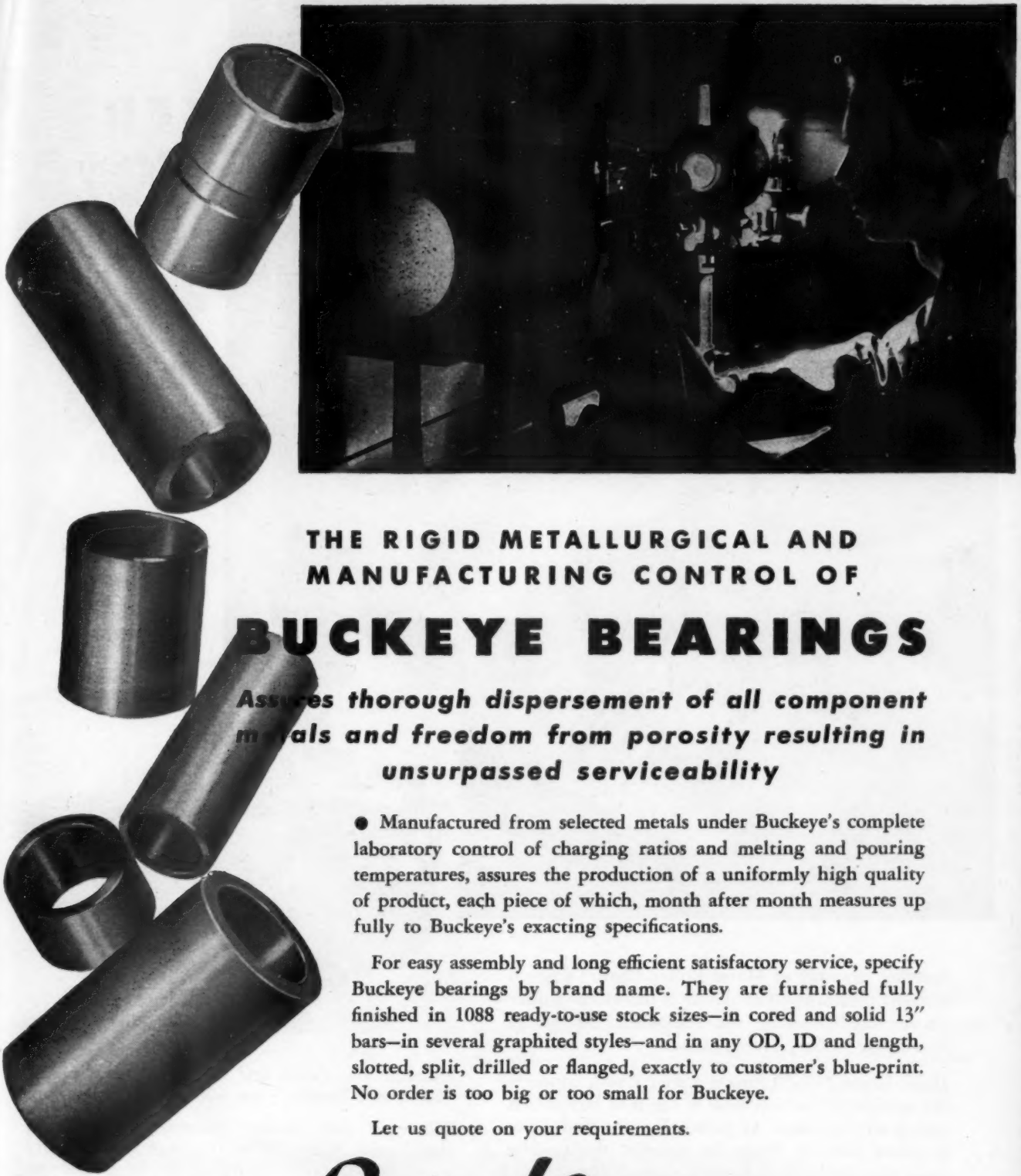

THE RIGID METALLURGICAL AND MANUFACTURING CONTROL OF

BUCKEYE BEARINGS

Assures thorough dispersement of all component metals and freedom from porosity resulting in unsurpassed serviceability

● Manufactured from selected metals under Buckeye's complete laboratory control of charging ratios and melting and pouring temperatures, assures the production of a uniformly high quality of product, each piece of which, month after month measures up fully to Buckeye's exacting specifications.

For easy assembly and long efficient satisfactory service, specify Buckeye bearings by brand name. They are furnished fully finished in 1088 ready-to-use stock sizes—in cored and solid 13" bars—in several graphited styles—and in any OD, ID and length, slotted, split, drilled or flanged, exactly to customer's blue-print. No order is too big or too small for Buckeye.

Let us quote on your requirements.

Buckeye

BRASS AND MANUFACTURING COMPANY

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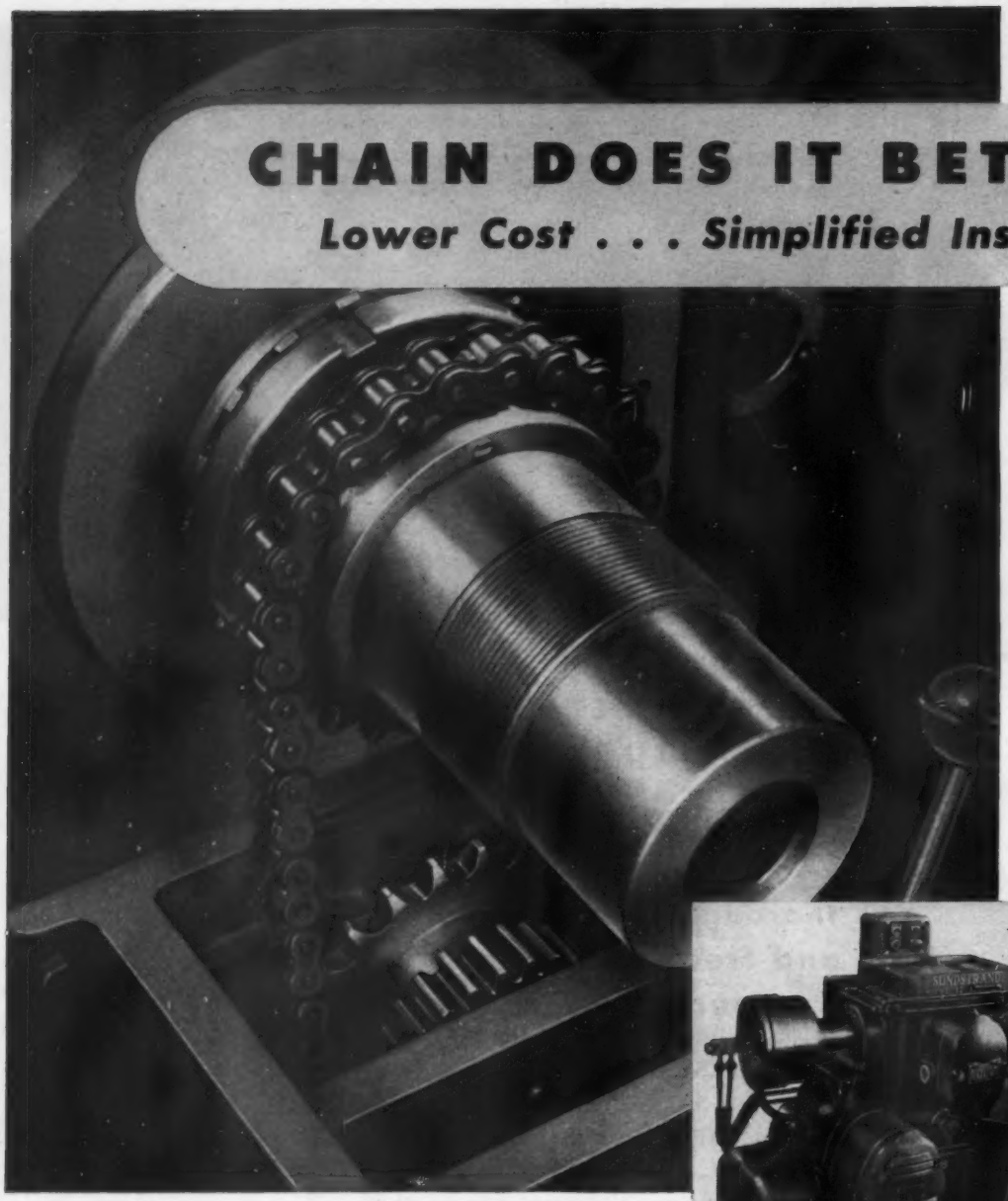
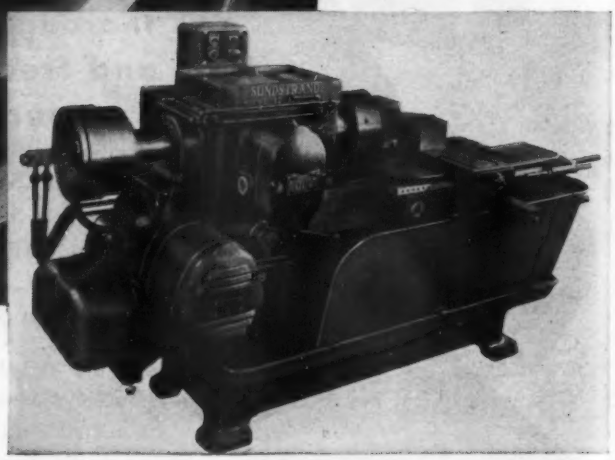
BRONZE SLEEVE BEARINGS · STANDARD SIZES OR TO CUSTOMERS' BLUEPRINT IN ANY RECOGNIZED BEARING METAL ANALYSIS

CHAIN DOES IT BETTER

Lower Cost . . . Simplified Installation





Another example of Morse Roller Chain's smooth efficient transmission of power is the Morse Roller Chain installation on the Sundstrand Model 12 Automatic Lathe pictured above.

Here, Morse No. 50 Single Roller Chain connects the spindle of the machine to the feed box which moves the carriage. As power for the feed drive is taken directly from the spindle, the spindle feeds and the carriage feeds are interlocked.

Here, too, as in hundreds of other installations, the use of Morse Chain permitted simplified installation at lower cost—and the Morse principle of "Teeth not Tension" assured efficient operation.

Whatever your power transmission problems, check with Morse. Morse Engineers will gladly work with you towards obtaining the results you want at the lowest cost—entirely without obligation on your part. Find out now how the principle of "Teeth not Tension" may save money for you.

SPROCKETS CHAINS FLEXIBLE COUPLINGS CLUTCHES

MORSE *Roller and Silent* CHAINS

MORSE CHAIN COMPANY • ITHACA, N.Y. • DETROIT 8, MICH. • A BORG-WARNER INDUSTRY

WE'VE BEEN ASKED

THIS ABOUT MAGNESIUM:

Is magnesium well adapted to die casting?

Sound, strong die castings of the highest quality are produced from Dowmetal Magnesium Alloys. The advantages of die casting techniques, combined with the high strength-weight ratio of magnesium alloys, make possible products which are strong, lighter in weight, yet comparable in price with die castings in other metals.

This aircraft cover plate is but one of many instances where Dowmetal's die casting properties have proved outstanding.

The surface finish of Dowmetal die castings is excellent . . . thinner sections are possible than with sand or permanent mold castings . . . accuracy and close dimensional tolerances reduce machining to a minimum. Dowmetal's low cost in large-run production is likewise an important consideration.

Since 1916 Dow has been producing, alloying and fabricating magnesium. The benefits of the accumulated knowledge, as well as the facilities of Dow's own fabrication shops, are readily available to those interested in Dowmetal die casting as a means of improving their products. Inquiries are welcome.

DOWMETAL *magnesium*

DOWMETAL

THE METAL OF MOTION

MAGNESIUM DIVISION • THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle

RIVETER GOES ON *Picnic...* PRODUCTION *Soars!*

The air-tool operators in a Western aircraft plant used to have trouble with the tools. They quickly lost their new-tool wallop.

Then a smart riveter saw an ad like this and talked her Boss into trying Norgren Lubro-Control Units. Now the whole plant is Norgren equipped! She and the whole air tool crew have been "on a picnic" ever since!

Do you know what our LUBRO-CONTROL unit is?

It is an assembly . . . a Filter, a Pressure Reducing Valve, and a Lubricator. The whole thing is less than a foot long. It is installed right in the air line that runs the air tool. A size for every need. Filter, Regulator, or Lubricator can be used separately.

NORGREN LUBRO CONTROL UNITS do this: (1) *Filter* dust, rust, and emulsions out of the air; (2) *Regulate Pressures* automatically; (3) *Lubricate* any type air tool—by injecting an oil-air fog into the air stream, lubricating every moving part of the tool. Automatic. Start and stop with the tool. Sight-feed.

No plant using air-driven tools, cylinders or devices of any type can afford to be without Norgren Units. They pay for themselves many times over. Don't take our word for it. PROVE IT YOURSELF. We guarantee your full satisfaction. C. A. Norgren Co., 220 Santa Fe Drive, Denver 9, Colo.

Get CATALOG 400 . . . and ask for our "The User the Prover" proposition. Do it TODAY!

Norgren

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The newest Aircraft Engines use more Sleeve Bearings than any other type. Bunting Bearings are outstanding in these Aircraft Engine programs.

Bearings made for such exacting service—life and victory depend upon them—are also worthy of thorough consideration in your design, whatever it may be.

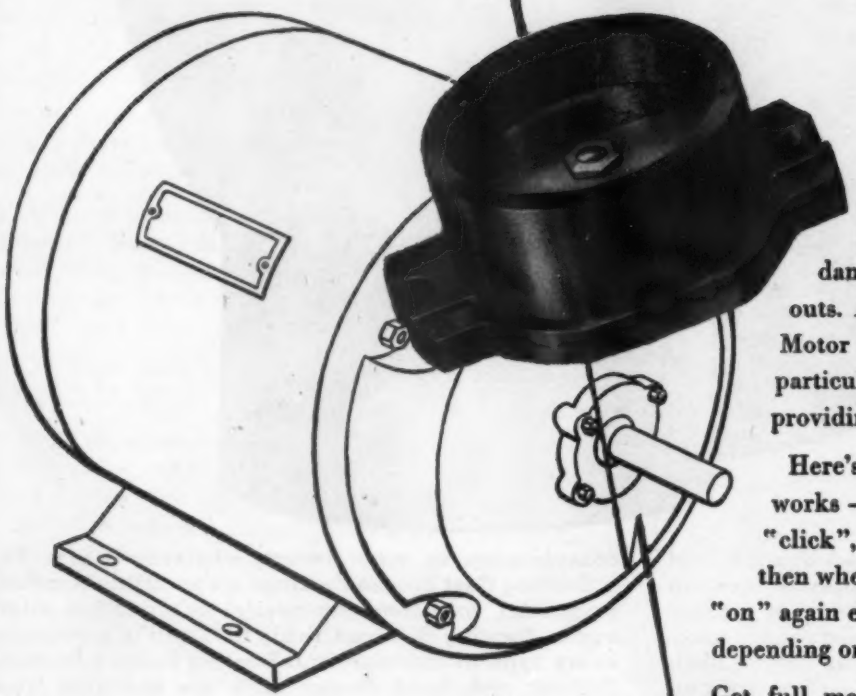
Bunting Cast Bronze Bearings are available standard or special, to either commercial or precision tolerances. Bunting Bearings, ready to install in practically every type of machine, and Bunting Factory-finished Tubular and Solid Bronze Bars are available from stock. Ask your wholesaler. Write for catalog . . . The Bunting Brass & Bronze Company, Toledo 9, Ohio. Warehouses in Principal Cities.

Bunting

BRONZE BUSHINGS ☆ BEARINGS ☆ PRECISION BRONZE BARS

PROTECTOR

OF A MOTOR'S LIFE



Built into the motor by the manufacturer—a Klixon Motor Protector protects a motor's life by preventing dangerous overheating and possible burnouts. And the best part of a built-in Klixon Motor Protector is that it is matched to the particular motor by the motor manufacturer providing a tested and proven combination.

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Get full motor life from your motors. Insist on Klixon Motor Protectors with every motor you buy. They'll reduce work stoppage, repair costs and delays. Klixon Protectors are available for D C. motors up to 30 volts—for A. C. motors all sizes.

KLIXON MOTOR PROTECTORS

SPENCER THERMOSTAT CO., ATTLEBORO, MASSACHUSETTS

If you plan to introduce a new product, it is important that you lick friction problems well in advance. Fafnir engineers will fully cooperate with you right from the start. If, on the other hand, you intend to resume manufacture of a former product, Fafnir's production facilities assure you a continuous and dependable supply of ball bearings in every size and type to meet all your needs.

Every requirement of speed, load, thrust, compactness and long life have been successfully met by Fafnir Ball Bearings. Let Fafnir help you engineer friction *out* of every turning point. The Fafnir Bearing Company, New Britain, Connecticut.

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Buy more War Bonds and Stamps

Behind the eight ball with Production Problems?

Because "eight balls" loom large in front of every production man at times . . . SYNCRO has developed a specialized service to remove such obstacles. SYNCRO specializes in tough engineering production problems and in the manufacture of precision machined tool products for Victory and after Victory. Consult SYNCRO now—without obligation.

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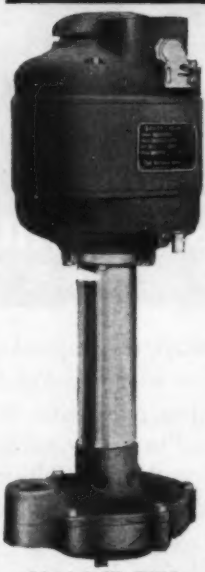
from **SMALL** *to* **LARGE!**



Model TL-7320
See Section 2 of new catalogue indexed for quick reference.

Whatever your special coolant needs, they are met by

GUSHER COOLANT PUMPS

One of the big advantages of Gusher Pumps, besides their simple design and rugged construction, is their flexibility of use, giving anything from 200 gallons per minute to the tiniest trickle since they can be throttled (according to type and size) to produce any desired flow *without injury to the pump* and without overloading motor.

The multiplicity of types and sizes available makes it easy to fit your special needs.

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The "Gusher"—A Modern Pump for Modern Machine Tools

IS ALREADY IN PROGRESS AT KROPP FORGE

We are still producing a tremendous volume of hammer, drop and upset forgings for the war machine and will continue to do so until V-day. Today, with invasion under way and various armament assignments completed, certain facilities at the "world's largest job forging shop" are available for civilian applications which are recognized as essential. Too, production on certain classes of forgings can be started as soon as the forging steel can be procured.

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NEW Model 1130 Centrifugal **PUMPING UNIT** for applying coolants to grinders, cut-off machines and other tools, or for supplying lubricants, solvents, etc. Heart of the unit is Model 1100 Gray-Mills Centrifugal Pump (inset), capacity 360 GPH at 5' head; motor is 1/15 H. P. Pump is available as independent unit.

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*5 foot head.

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Complete Portable

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FRACTIONAL H. P. PUMPS
INDUSTRIAL FLUID REFRIGERATING SYSTEMS
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Polished precision-ground pins for accurate locating of work; tolerance limit .0002" over basic size (with allowable tolerance of .0001".) Metallurgically in the class of ALLEN Hollow Screws:—made of the same special-analysis ALLENOY steel and heat-treated with the same scientific controls.

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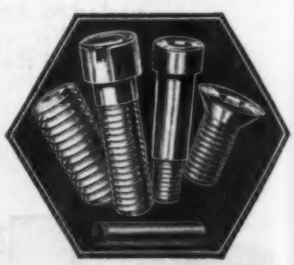

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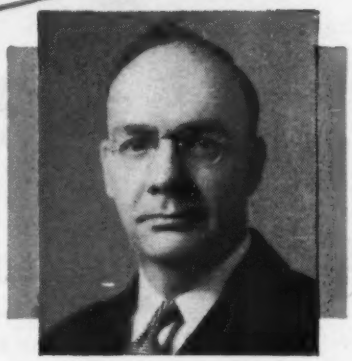

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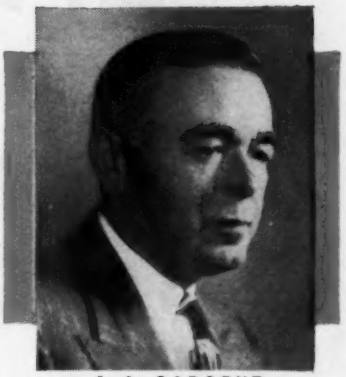

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THE BEARING METAL FOR 9 OUT OF 10 APPLICATIONS

More often than not bearing failure can be traced to improper selection of metal for the lining. Choice of alloy *should* be dictated by the type of load under which the bearing operates.

In 90% of all applications the load is uniform and pressure moderate, as is the case with electric motors, line shafting and machinery in general. For such service, the metal to select is the one having the best anti-frictional qualities.

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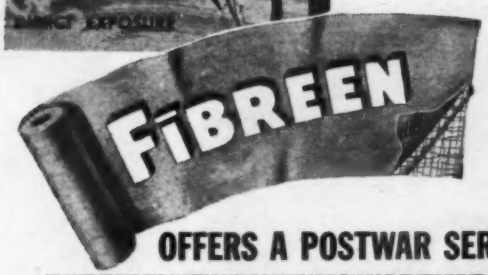
NEVER BEFORE HAS A WRAPPING MATERIAL WITHSTOOD SUCH PUNISHMENT



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It's a definite help to workers to be able to see, at any time during their shift, exactly what their machine is doing and whether it is keeping up to its work-schedule on war production. And they always *can* see, if there are Veeder-Root Counting Devices installed on their machines, to keep *continuous count* in terms of turns, strokes, pieces, lengths, volumes or any other units of performance. For then they can spot trouble the instant it begins to develop . . . and can either make the necessary adjustments themselves, or call the maintenance men in plenty of time . . . before shortages develop and final assembly bogs down.

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on every production machine and process

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have great holding power

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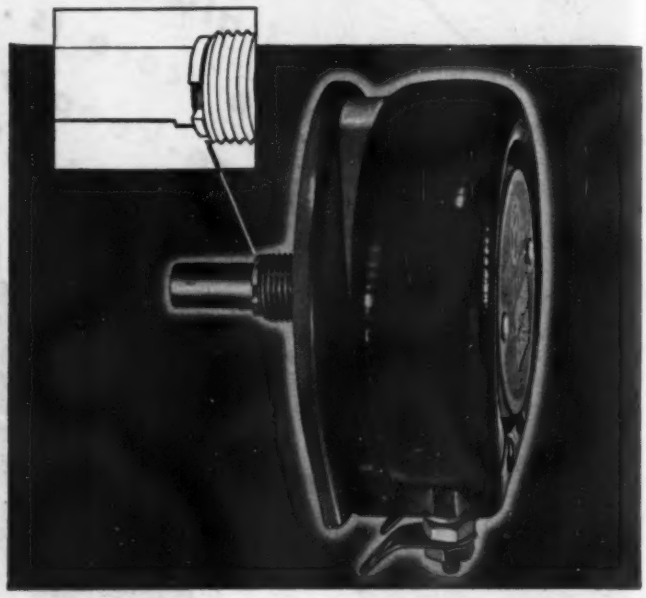

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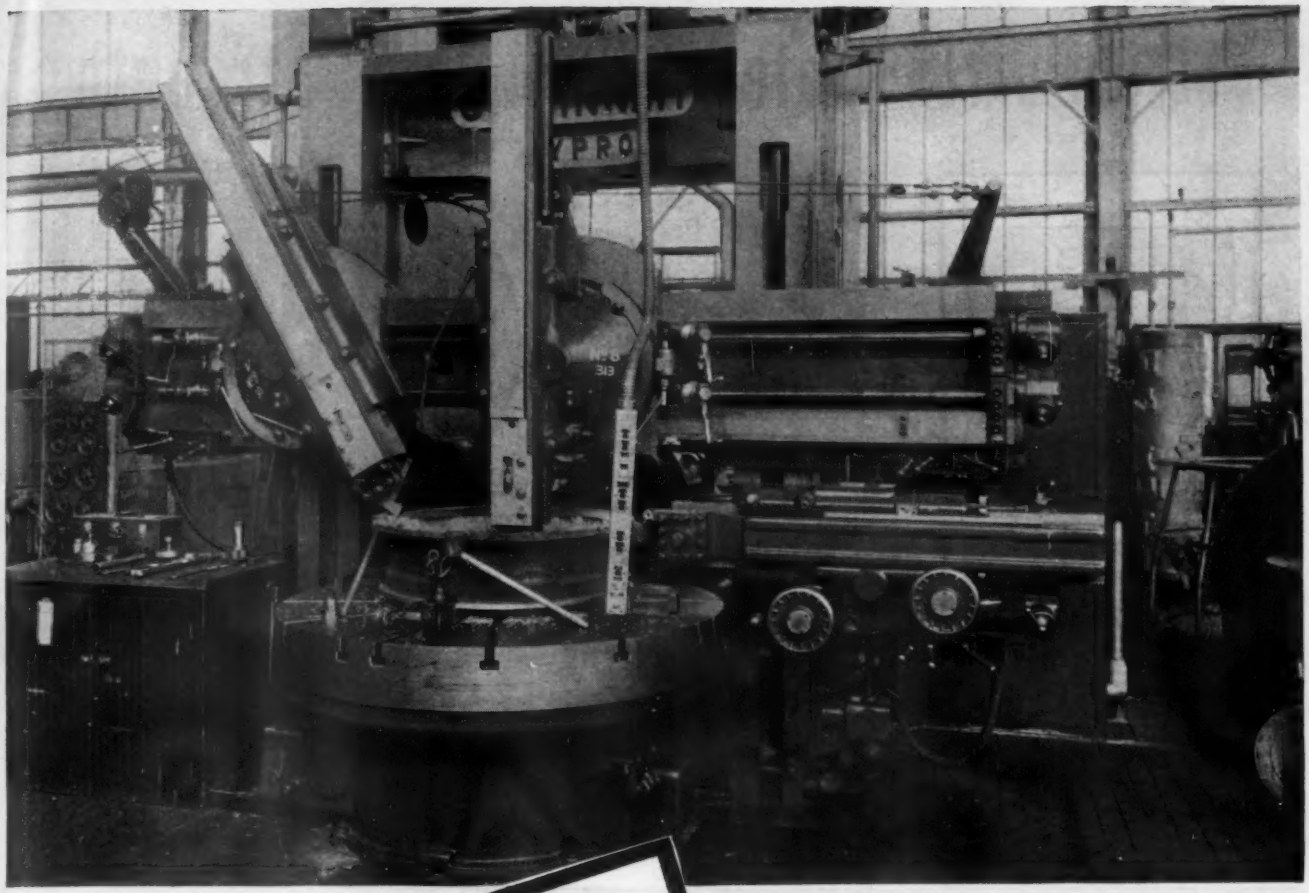

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Precision for boring mills

SKF

BALL AND ROLLER BEARINGS

On this Cincinnati 6′ Hypro Boring Mill an SKF Double Row Cylindrical Roller Bearing is used for centering the table. With this bearing comes *smoothness* from a large number of staggered ultra-precision rollers which are lapped by a special method. In addition, there's *rigidity* from long surface contact of rollers combined with *constant low temperatures* due to low friction. The right bearing in the right place is essential to maximum low cost production from any machine—anytime. 5641

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DESIGNED FOR Safety . . . BUILT FOR Strength

Hollow Set Screw

Hollow Lock Screw

The advantages of hollow set screws include safety on revolving or moving parts, ease of assembly in confined places, and more compact construction.

Mac-it Hollow Set Screws offer these design features, plus great strength. They are heat-treated to resist upsetting of the point, rounding out of the hex sockets, and splitting of sockets at the corners.

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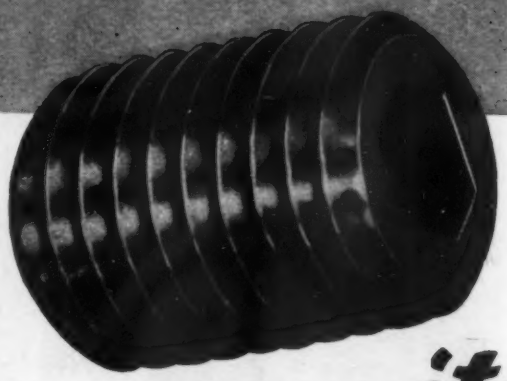

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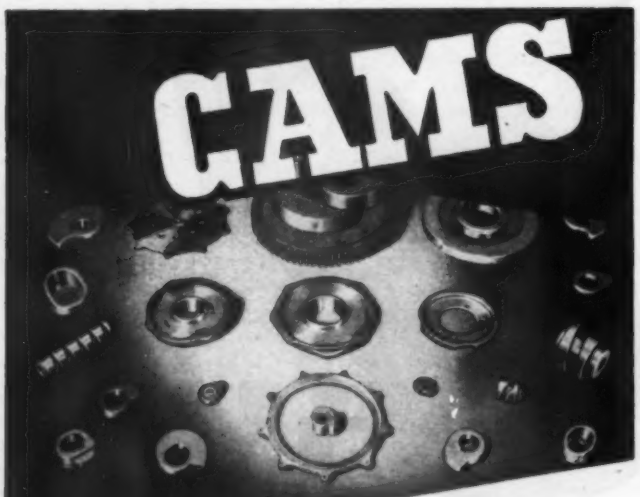

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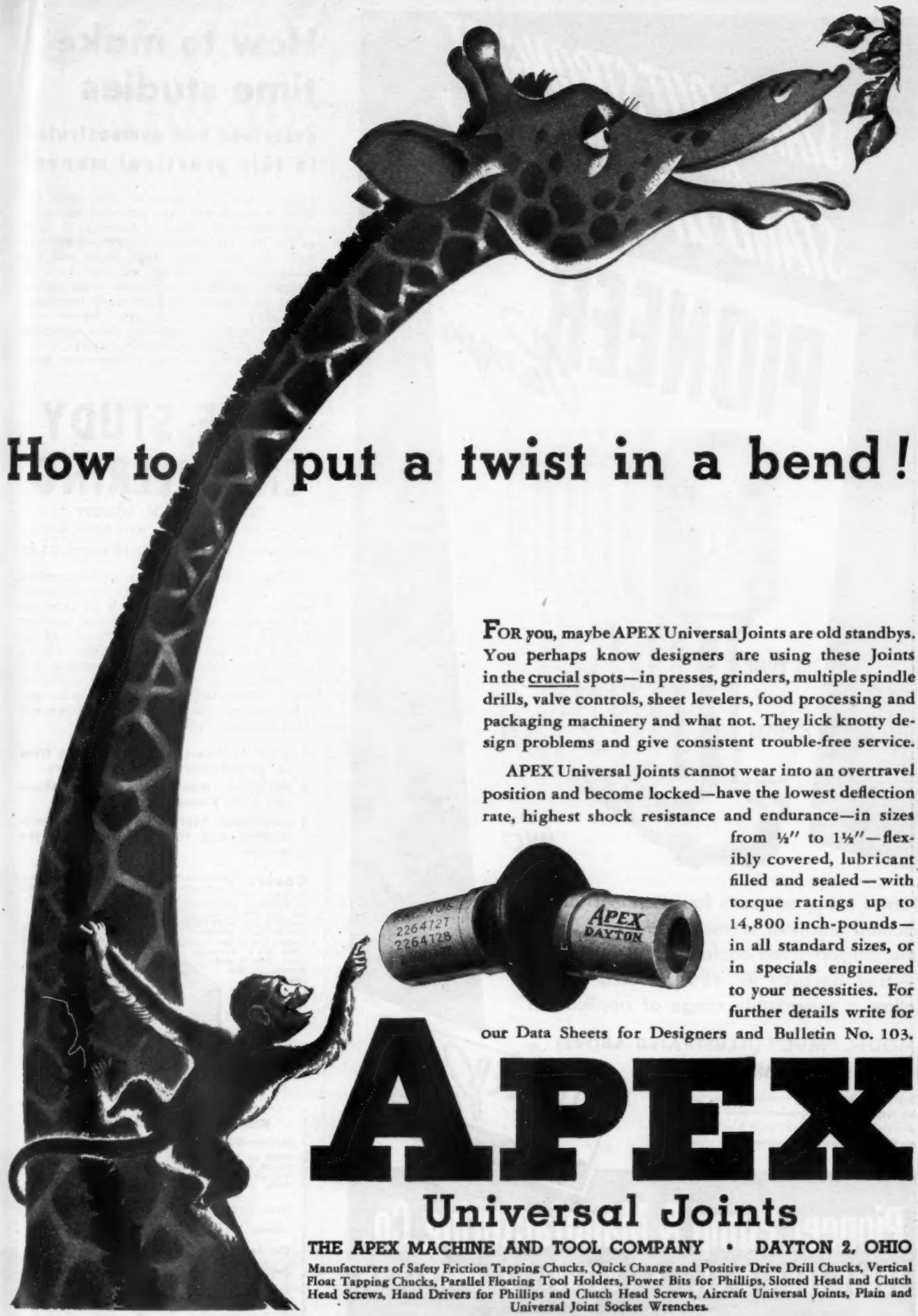

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STAND OUT STRONGEST BECAUSE THEY STAND UP LONGEST!

PIONEER Pumps

Here's the pump that's found on *most of the leading machines in the world* because it's the *longest-lived* coolant pump ever built — and because its *400 standard models* allow a remarkable range of application!

MODEL "MVC" (ILLUSTRATED ABOVE) FOR SMALL MACHINES

Built especially for small machines such as hand milling machines, surface grinders, internal grinders, drill presses, tapping machines, small bench lathes, etc. No quality feature is overlooked in their construction.

PIONEER Pumps
HIGH EFFICIENCY • LOW POWER CONSUMPTION
GREATER VOLUME AND LESS MAINTENANCE

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described and demonstrated in this practical manual

Here at last is a course in time study for those who do not have extended technical, mathematical, or industrial training. It starts at the very beginning and covers completely both the methods of time study and the background of machines and operations of industry the time study man must understand, in a practical, home-study treatment. The author of the book says, "Anyone who can rate 90% in answering these questions (appearing at the end of each chapter) would be able to take and hold a time study position in any industry."

TIME STUDY ENGINEERING

By WILLIAM H. SCHUTT
President, Detroit Time Study School, Inc.

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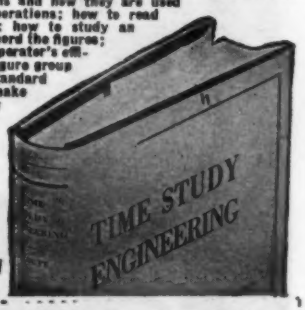
The book shows the whys and wherefores of time study work, reviews the arithmetic needed, tells step by step how to carry out a time study and gives a wealth of information on the machines and processes of industry, what the time study man should know about their construction and operation, and the special factors of taking time studies on each. Twenty-eight specimen studies on specific machines and operations are shown and fully discussed in the text.

- **gives 26 time-study charts; each from an actual observation in industry.**
- **describes machines and operations and their time-study factors.**
- **emphasizes factors of economical production and fair standards for the worker.**

Covers: Fundamentals of time study, requirements of work, equipment and how it is used, etc.; the basic motions and how they are used in analyzing operations; how to read the stop watch; how to study an operation and record the figures; how to rate the operator's efficiency; how to figure group bonus and standard hours; how to make process or flow charts, etc.



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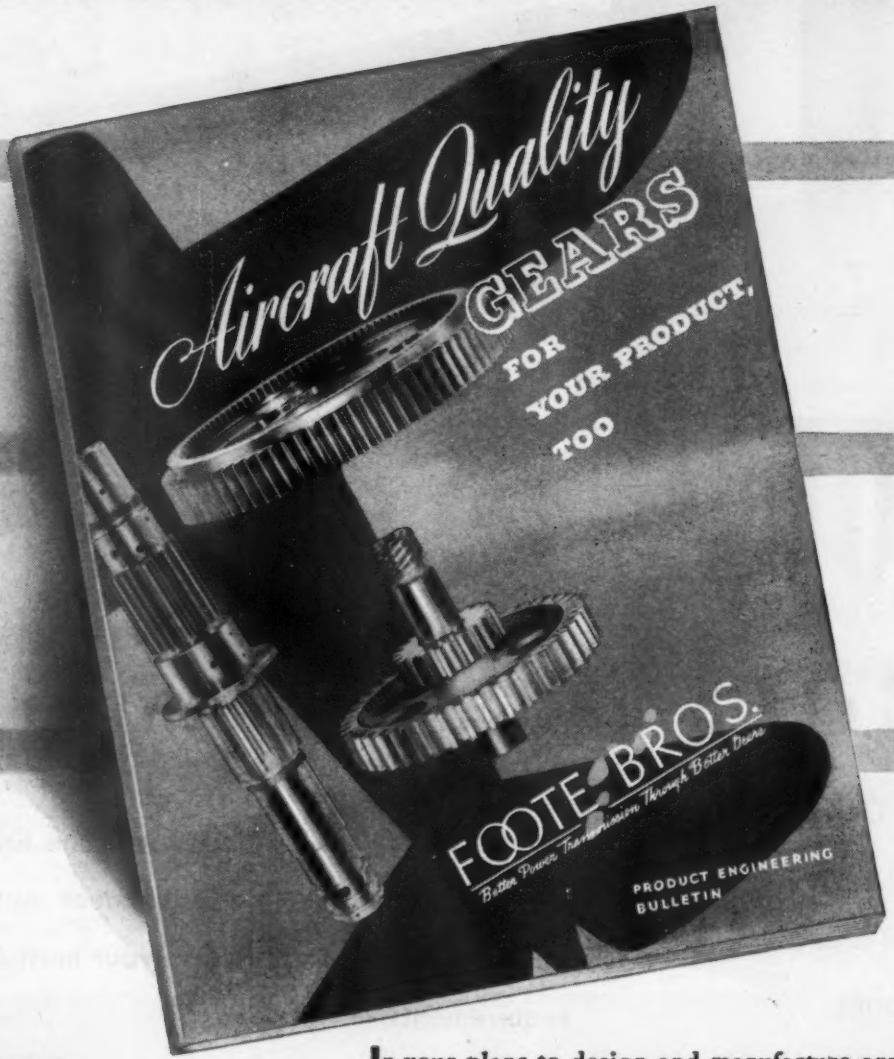

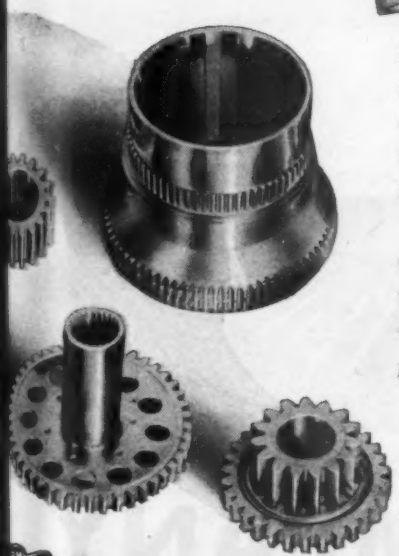

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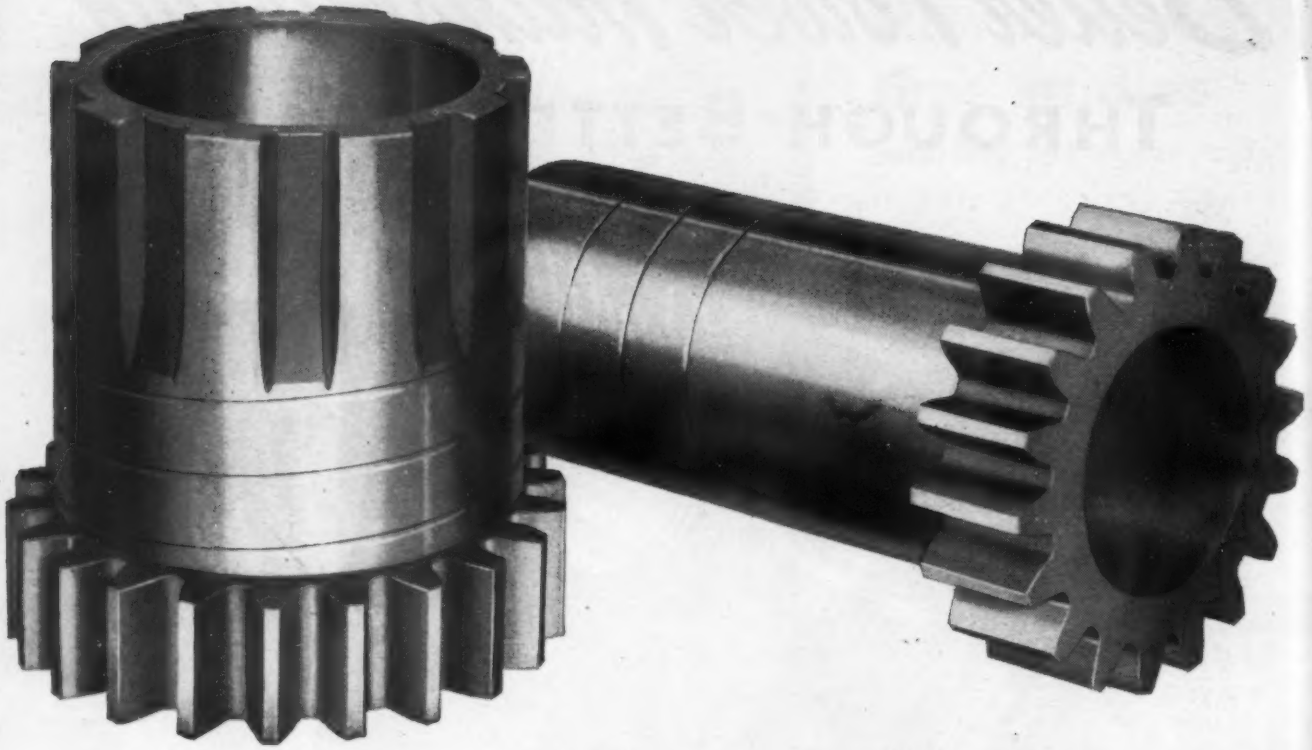

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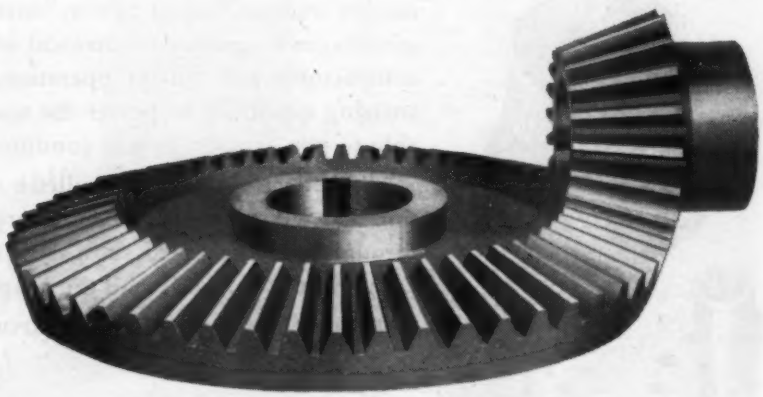

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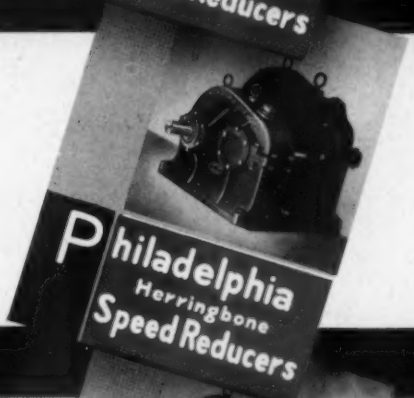

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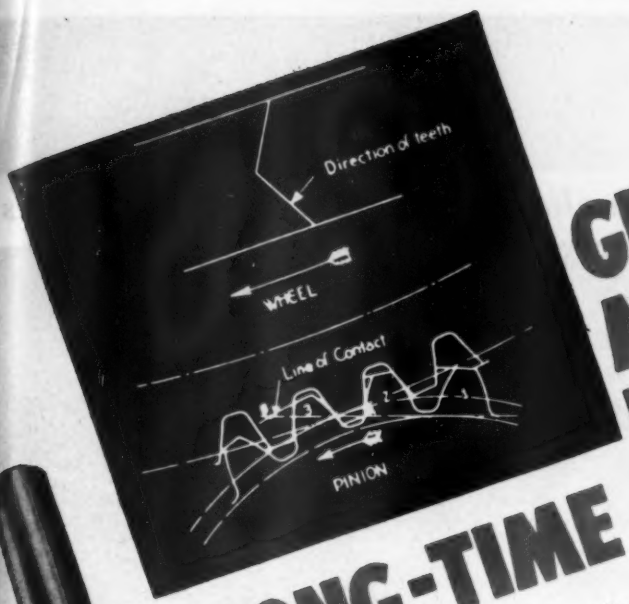

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When the gears in a machine tool become worn, its precision days are over. True, the machine can still be used—but not for jobs requiring extreme accuracy.

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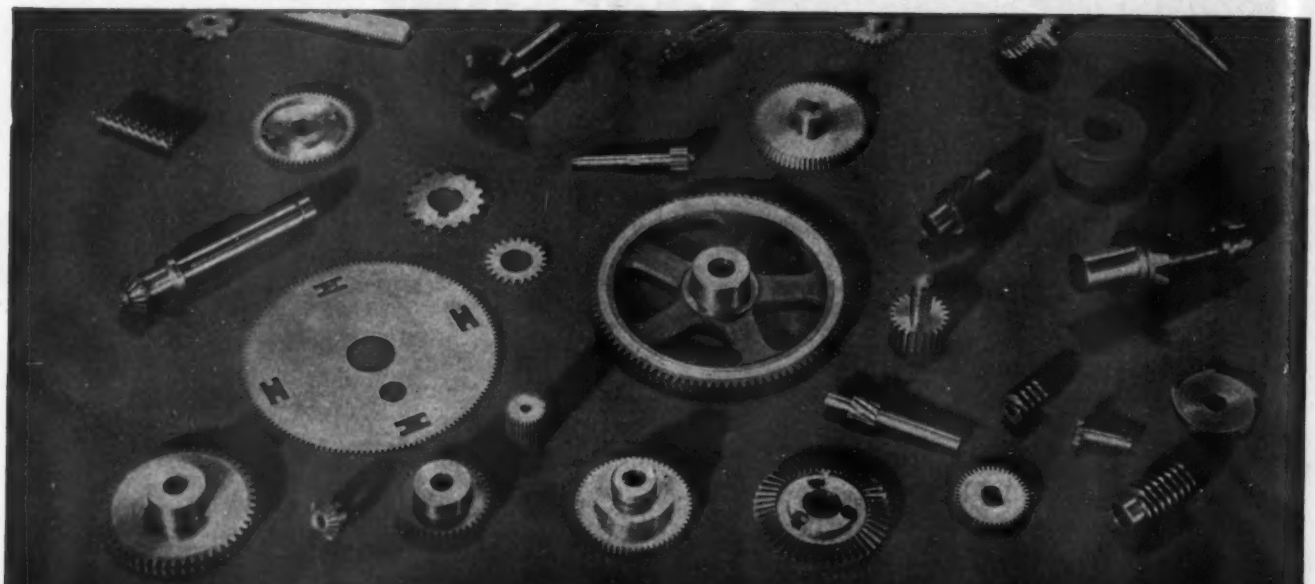

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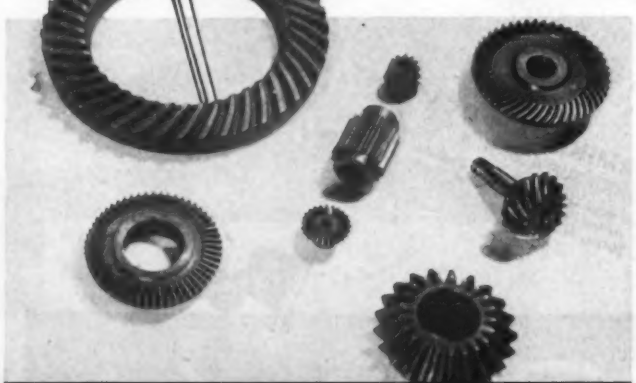

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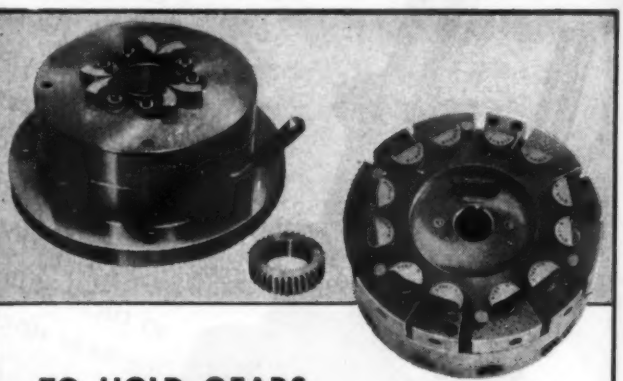

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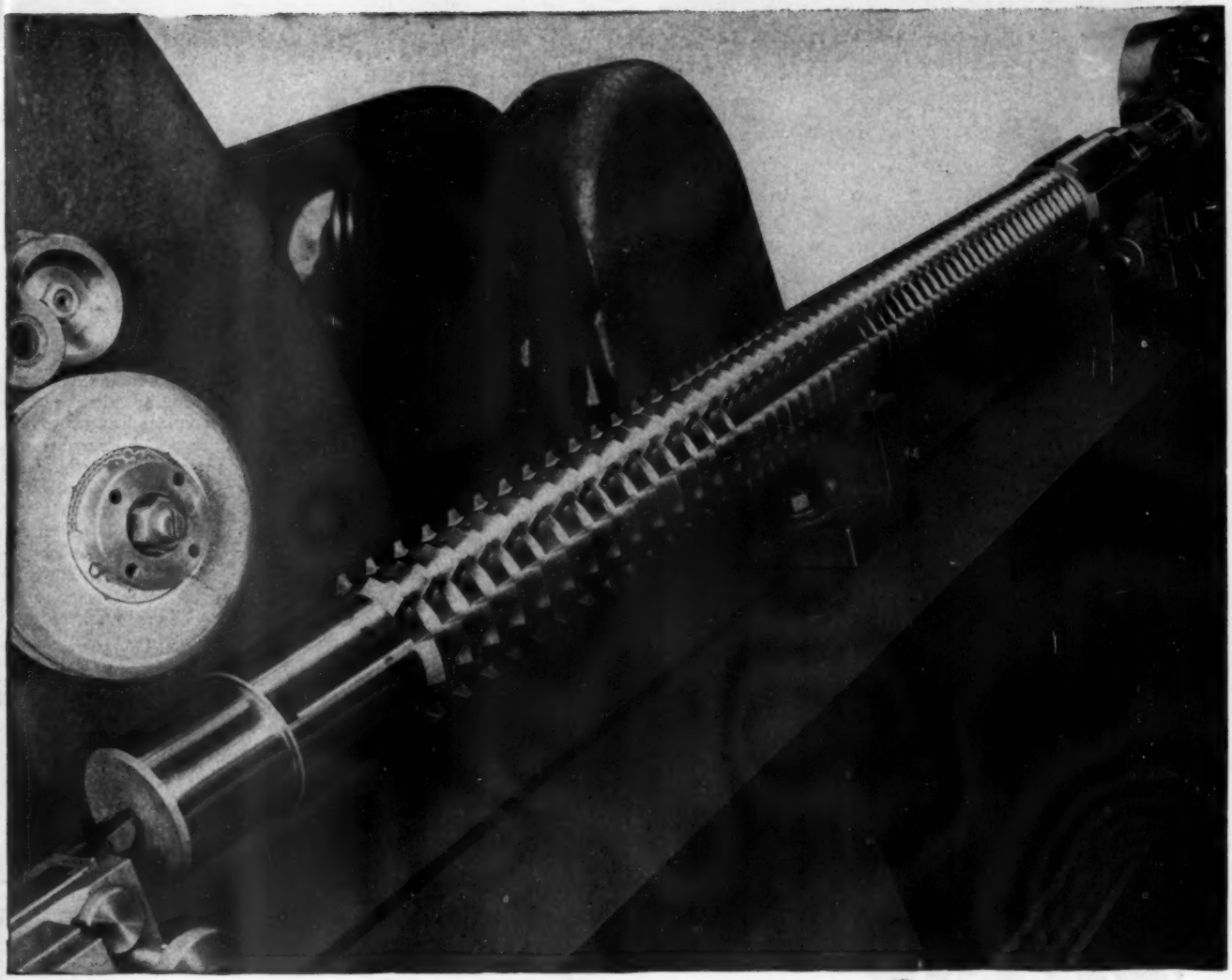

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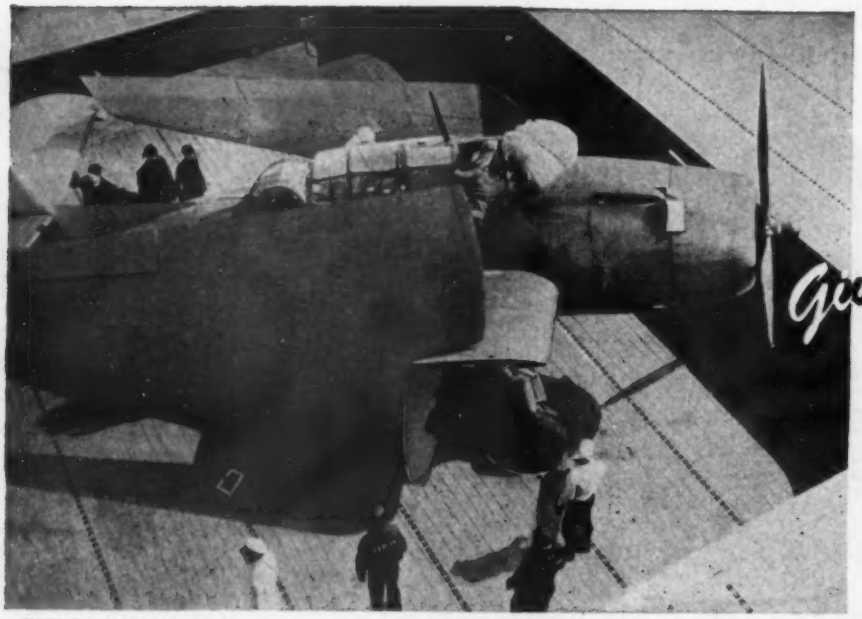

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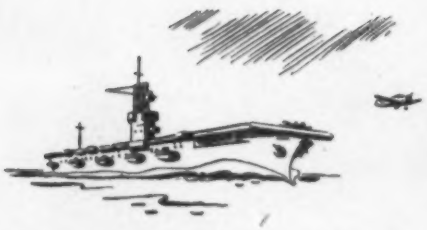

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Every gear produced in the SIER-BATH gear plant is individually checked before shipment, which assures its meeting final assembly requirements without delay.

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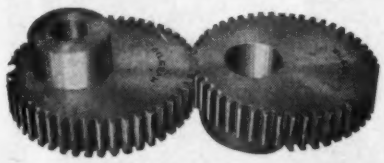

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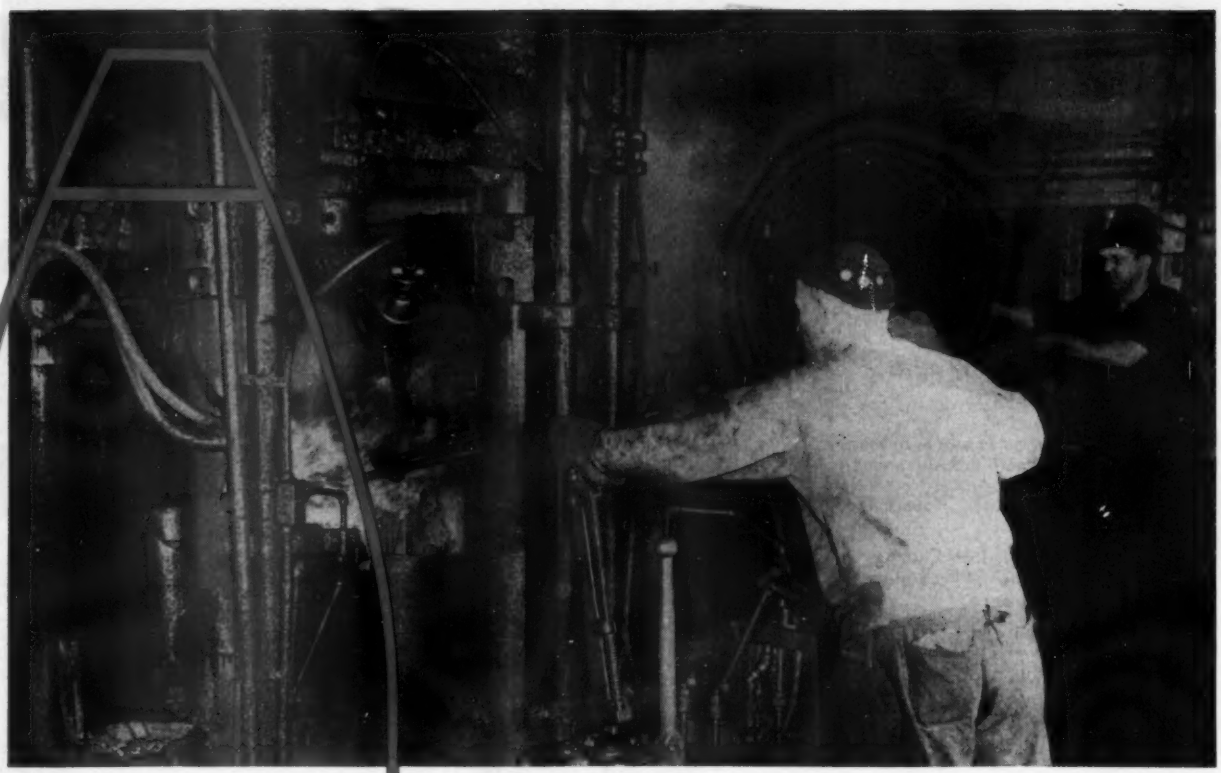
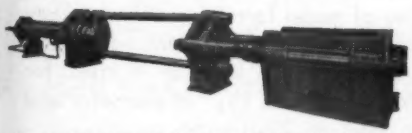


Heated steel billets are pierced for almost their full length, and shaped into cylinders, on Elmes 500-ton piercing presses at Willys-Overland.

Elmes hydraulic descaling presses (shown without jaws) remove heating scale from billets before piercing.



Elmes 250-ton horizontal hydraulic draw benches, with 10-ft. ram stroke, size and elongate the shell blanks.

One of several Elmes six-plunger, high-pressure, high-capacity hydraulic pumps used with an Elmes accumulator system to operate all hydraulic units.

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Mass manufacture of shell blanks has benefited from Elmes ingenuity, developed over nearly a century, in applying hydraulic equipment to the exacting requirements of industry. You too can put your pressing problems up to Elmes, for well-informed recommendations, correct design, and sound construction. Elmes Engineering Works of American Steel Foundries, 1001-1013 Fulton St., Chicago 7. Also made in Canada.

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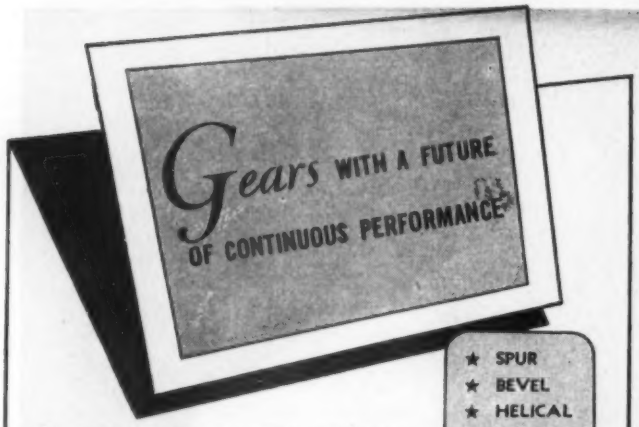

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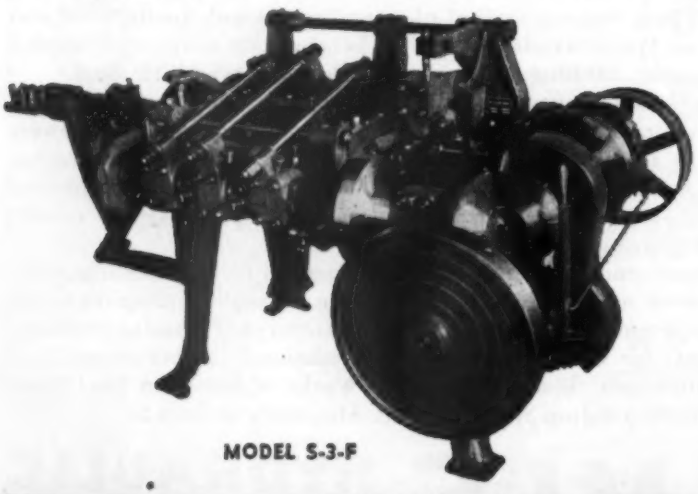

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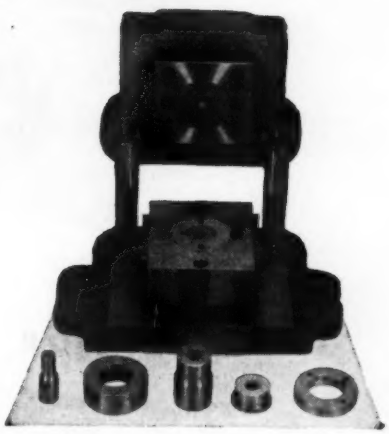

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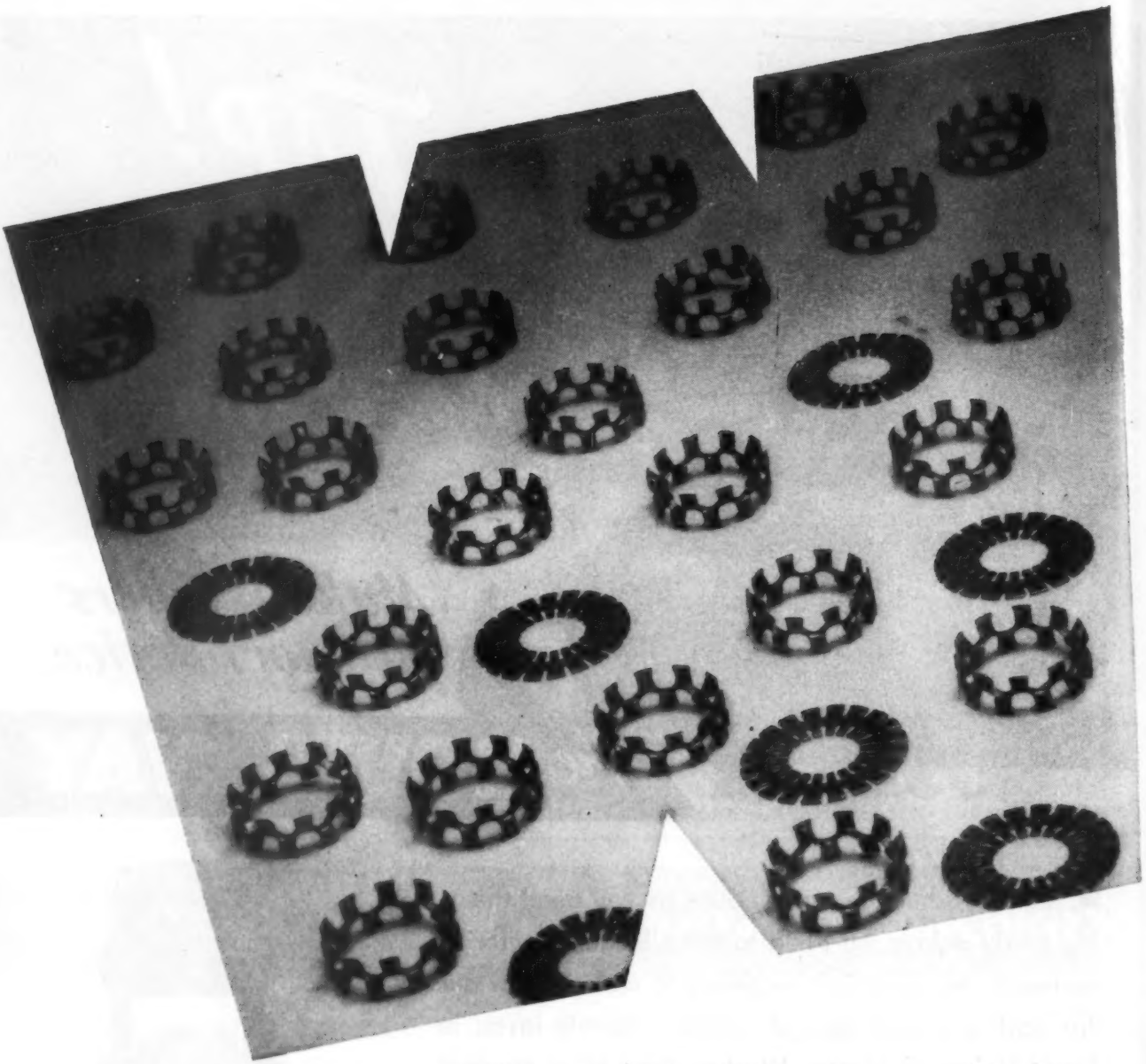

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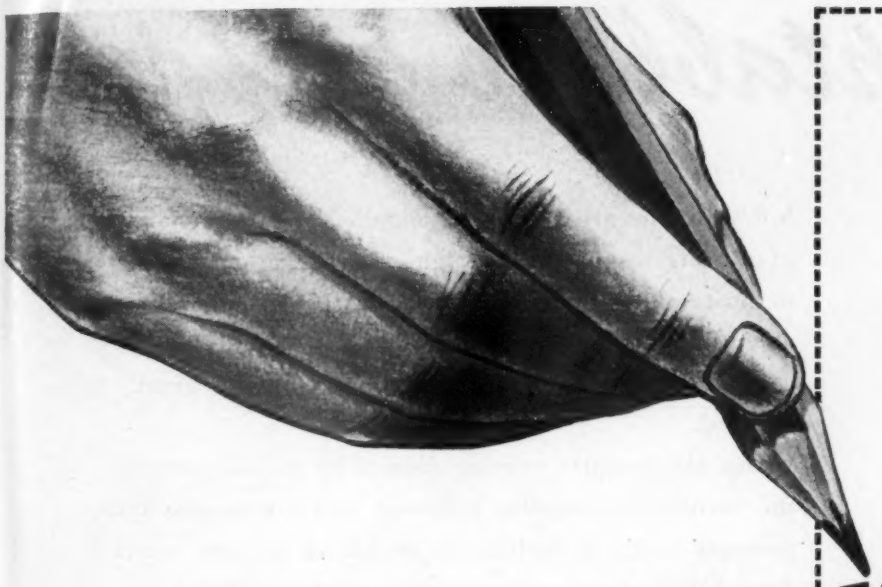

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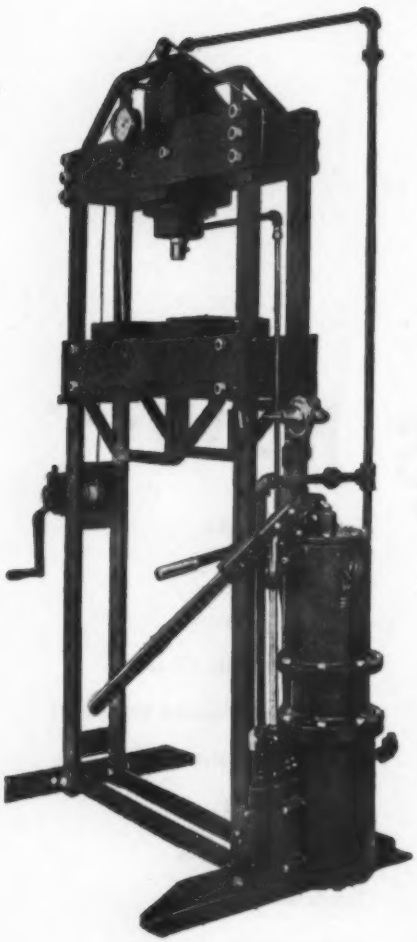
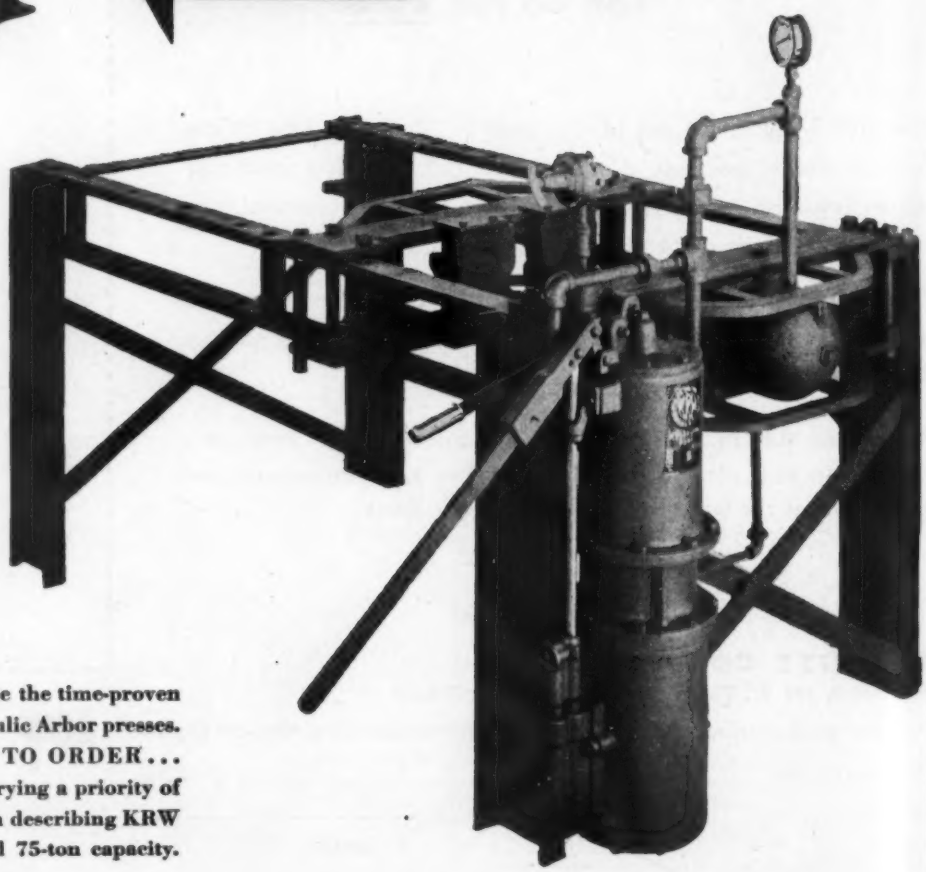
Adaptable to any job,



KRW Presses are designed to handle the great majority of pressing, bending and straightening operations normal to most industries. In addition, KRW Presses are adaptable to literally hundreds of special jobs. Using low-cost dies, manufacturing costs on many items are greatly reduced.

Using air pressure varying from 100 to 225 pounds, the resulting hydraulic pressure varies with the air pressure used. A built-in air regulator permits exact duplication of pressure on every stroke . . . this is important on many operations. KRW Hydraulic Arbor Presses are available for either vertical or horizontal operation or specially built to handle a particular operation. We also manufacture suitable capacity air compressors. Write for fully-illustrated Hydraulic Arbor Bulletin. K. R. WILSON, 10 Lock St., Buffalo 2, N. Y.

VERTICAL OPERATION

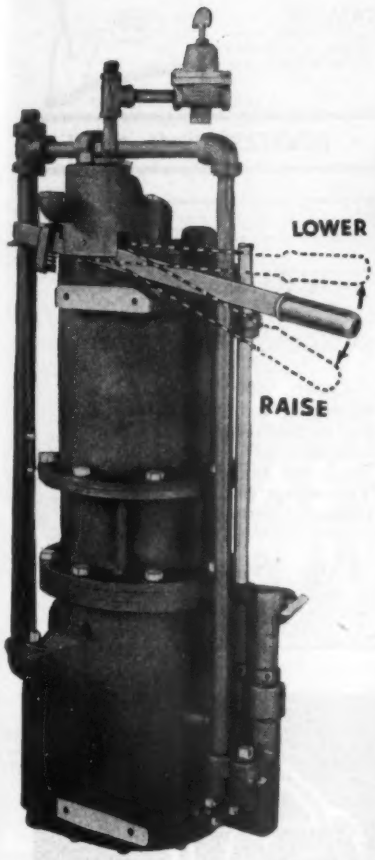


HORIZONTAL OPERATION

All KRW special presses incorporate the time-proven features of the standard KRW Hydraulic Arbor presses. They are now available . . . BUILT TO ORDER . . . for quick delivery on all orders carrying a priority of AA-4 or better. Write for new bulletin describing KRW Hydraulic Presses in 25, 50, 60 and 75-ton capacity.

these Low-Cost KRW

HYDRAULIC ARBOR PRESSES SAVE TIME, SPACE AND MONEY



THE KRW *Speedi-Booster*

THE REASON WHY KRW PRESSES ARE FAST AND ACCURATE. The KRW Speedi-Booster eliminates the need for the conventional Capstan wheel or pumping lever. Instead, it uses compressed air as the motive power operating the ram. Because the compressed air is controllable through a pressure regulator, any desired tonnage pressure at the ram can be obtained and duplicated. Ram movement (up, down or stop) is instantly controlled with the slightest fingertip movement of the lever.

ADAPTED AS A LOW-COST FORMING BRAKE

AVAILABLE TONNAGE PRESSURES

25-50-60 TON PRESSES

AIR PRESSURE	7" AIR CYLINDER		9" AIR CYLINDER	
	2" Oil Cylinder	1¾" Oil Cylinder	2" Oil Cylinder	1¾" Oil Cylinder
100 TO 200 POUNDS	10 to 22 Tons	14 to 29 Tons	17 to 35 Tons	23 to 47 Tons

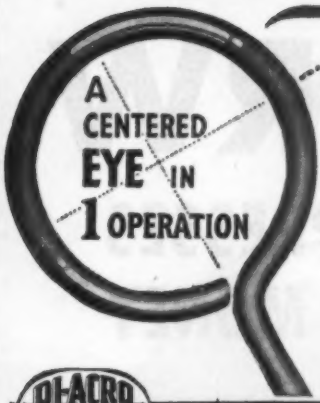
75 TON PRESS

AIR PRESSURE	9" AIR CYLINDER	
	2" Oil Cylinder	1¾" Oil Cylinder
100 TO 200 POUNDS	25 to 51 Tons	33 to 68 Tons

Write Today for the KRW HYDRAULIC PRESS CATALOG

K. R. WILSON

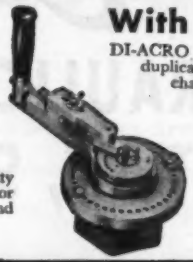
10 LOCK ST., BUFFALO 2, N. Y.



Precision CENTERED EYE Bending

The DI-ACRO Bender makes perfectly centered eyes from rod or strip stock at high hourly production rates. Both eye and centering bend are formed with one operation. Any size eye may be formed within capacity of bender and ductile limits of material.

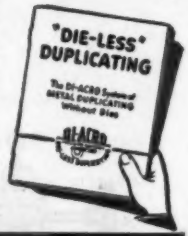
DI-ACRO Bender No. 1
Forming radius 2" approx. Capacity ⅜" round cold rolled steel bar or equivalent. Also Benders No. 2 and 3, with larger capacities.



With DI-ACRO Benders

DI-ACRO Precision Bending is accurate to .001" for duplicated parts. DI-ACRO Benders bend angle, channel, rod, tubing, wire, moulding, strip stock, etc. Machines are easily adjustable for simple, compound and reverse bends of varying radii.

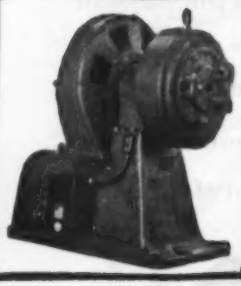
Send for CATALOG
"DIE-LESS" DUPLICATING showing many kinds of "Die-less" duplicating produced with DI-ACRO Benders, Brakes and Shears.



DI-ACRO PRECISION MACHINES DIE-LESS DUPLICATING

O'NEIL-IRWIN MFG. CO. 311 EIGHTH AVENUE SOUTH • MINNEAPOLIS 15, MINN.

"Ask ETNA about Swaging"



● If you have a production phase that calls for tapering, sizing or reducing of solids or tubes, you can save money if you "ASK ETNA ABOUT SWAGING." The superior performance of ETNA machines assures you more pieces per hour at lower cost. Built in capacities of ⅛" to 4" . . . larger sizes built to order!

Ask for our swaging catalogs

The ETNA MACHINE Co.
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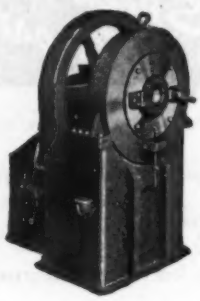

THE
TORRINGTON
ROTARY
SWAGING MACHINE

— with 4000 forceful squeezing hammer blows per minute—makes metal tougher and more elastic. Send for booklet—"The Torrington Swaging Machine."

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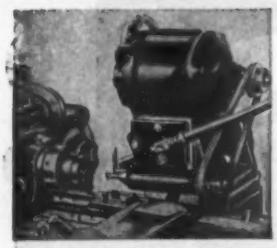
WALTHAM THREAD MILLERS

put precision thread milling on a production basis



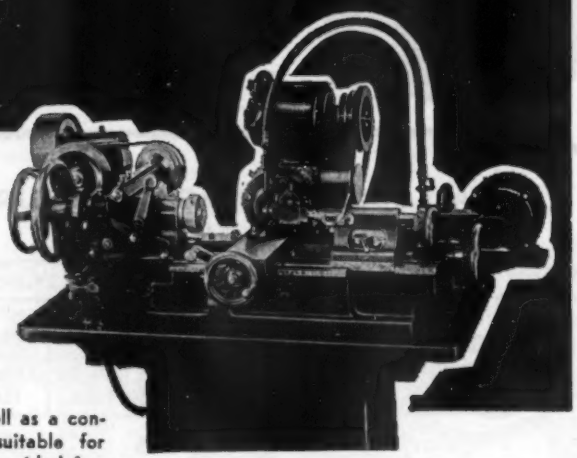
Waltham Thread Miller equipped with Internal Threading Attachment.

Machine equipped with Relieving Attachment.

These improved machines are fast, accurate and versatile. They will mill all standard forms of threads quickly, conveniently and accurately, cutters for which are available from Waltham.

Standard design includes three motors (one each for speed, feed and oil), a feature which permits individual speed change and reverse for both cutter and the work as well as a constant speed for the pump. Speeds suitable for either brass or steel or both are easily provided for. All motors are controlled from one convenient station.

Extra equipment available includes: plain and compound taper attachments, translating gears for cutting metric leads, metric lead screw, relieving attachment, special heads for internal and multiple cutter threading, and automatic cam operation, special equipment for cutting long lead.



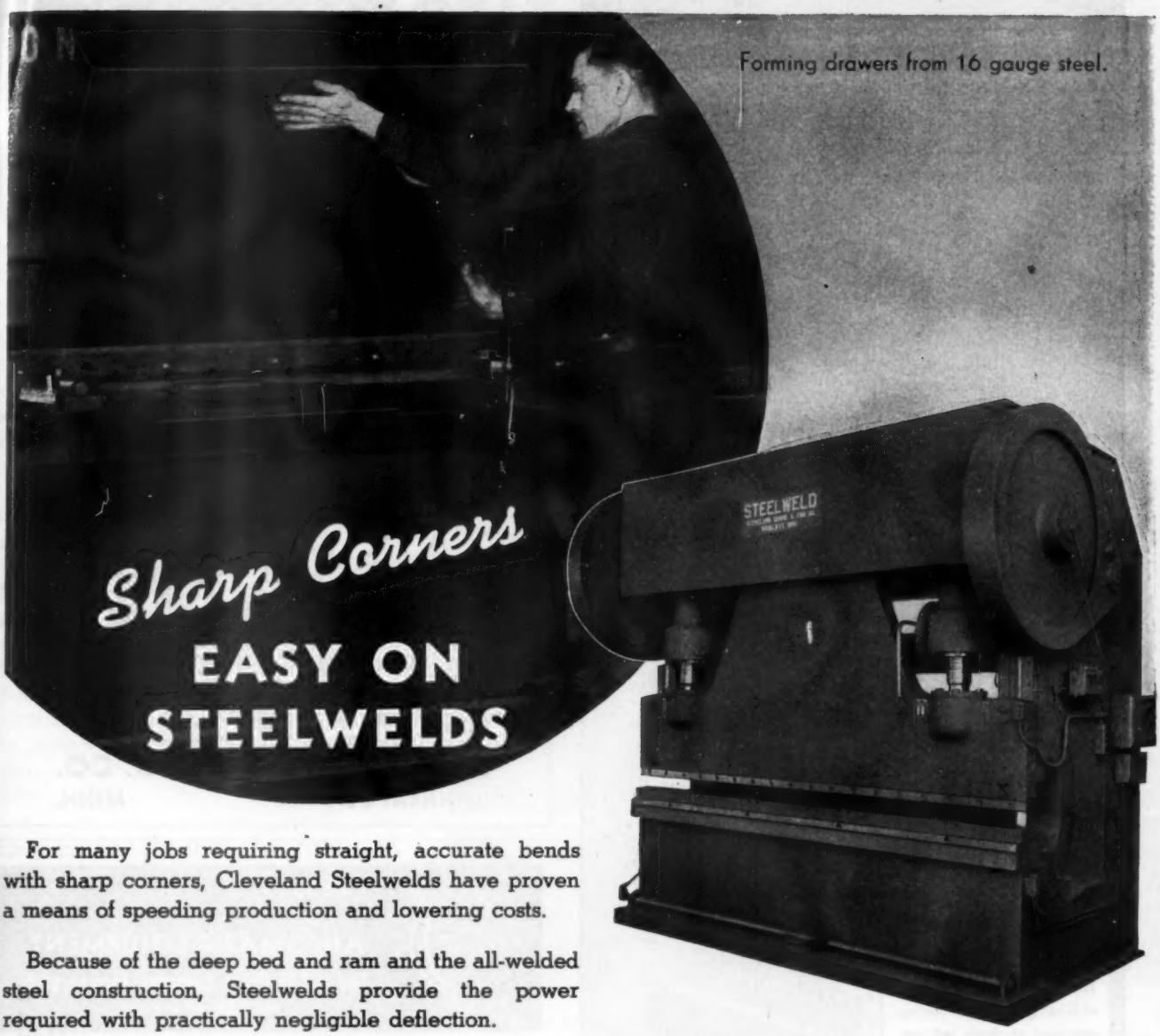
SPECIFICATIONS

Swing over carriage 3"
Capacity (Diameter of work) 2" or smaller
Thread length (work held on centers) 8¾"
Thread length (work held in spring chuck at one end) 10"
Diam. hole through spring chuck ⅝"
Dia. hole through work spindle ¾"
Floor Space 48" x 34"
Motors: 1/3-1/4 and 1/6 HP

SEND FOR DESCRIPTIVE LITERATURE GIVING COMPLETE DETAILS.

WALTHAM MACHINE WORKS WALTHAM MASS.

WALTHAM TRADE MARK REGISTERED U.S. PAT. OFF.



For many jobs requiring straight, accurate bends with sharp corners, Cleveland Steelwelds have proven a means of speeding production and lowering costs.

Because of the deep bed and ram and the all-welded steel construction, Steelwelds provide the power required with practically negligible deflection.

Many press men feel Steelwelds have features that make them especially advantageous for this work. The ram stops quickly with little drift. Exact pressure desired is easily obtained. Clutch and brake are simple to adjust. Very little maintenance is required.

A great advantage of Steelwelds is that through use of quickly changed dies, punching, beading and many other operations are handled with equal dispatch.

Cleveland Steelwelds are available for plate of all gauges up to one inch and for lengths up to 20 feet.

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CATALOG No. 2002 gives complete construction and engineering details. Profusely illustrated

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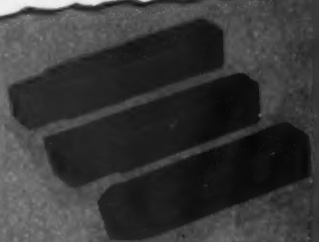

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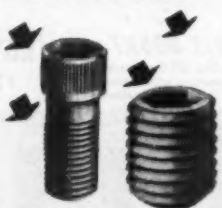

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DANLY PRECISION DIE SETS

Fastermatic AUTOMATIC TURRET LATHE

INCREASED PRODUCTION OVER 5 TIMES

on Airplane Propeller Shafts . . .

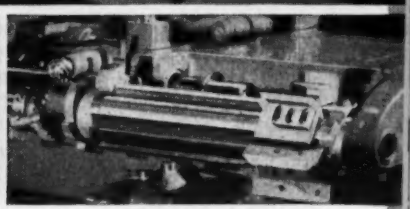
Four Operators Run 7 Machines

The application of a Foster Fastermatic Automatic Turret Lathe to machining airplane engine propeller shafts increased production as much as 5 times on one operation. One hand operated turret lathe, formerly performed the 1st operation on 3 shafts in 8 hours. Now two Fastermatics with one operator perform this operation on 32 parts in 8 hours.

This production increase, common with Fastermatics, is possible because of a combination of exclusive features which results in maximum operating efficiency. Two of these features are the automatic speed control and hydraulic feed system, which permit tooling arrangements for handling 31 operations, using a total of 9 feed changes and 6 speed changes, automatically made.

Easy to Set Up and Operate

The Fastermatic is a pace setter for high production work due to its automatic machining cycle. The operator has only to load and unload the work. In actual operation one operator can usually handle several machines. All controls and adjustments are simple and convenient, and set-up changes can be made with very little effort.



Automatic Speed Control

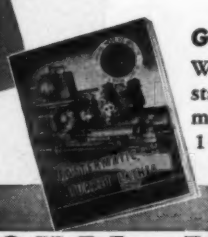
To maintain the most efficient operating speeds at all times, speed changes are automatically made by hydraulically operated clutches, and may be made for each face of the turret at any time during the cut or forward rapid traverse. Standard buttons placed on the master spool, shown above, effect the changes and determine the proper time of making the change.

Hydraulic Feed System

An infinite number of feeds are provided by a flexible hydraulic feed system, with the rate of feed desired automatically controlled for each operation by standard cams mounted on the cam drum, shown above. A separate and independent feed for each face of the turret is provided.

Facts about this Job!

Machine—Battery of Foster 3F Fastermatics.
Part—Airplane Engine Propeller Shaft.
Material—Alloy Steel, 3.5 Brinell Hardness.
Feeds:
1st Operation—.017"—.014"—.020"
2nd Operation—.012"—.015"—.007"—.011"—.012"—.018"
3rd Operation—.010"
(Automatically changed)
Speeds:
1st Operation—40 r.p.m.—58 r.p.m.
2nd Operation—40 r.p.m.—58 r.p.m.—40 r.p.m.—58 r.p.m.
3rd Operation—205 r.p.m.
(Automatically shifted at proper time)
Floor-to-Floor Time—1st, 18 min.; 2nd, 42 min., 3rd, 8 min.



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A large and competent engineering staff is maintained to make suggestions for your present and future turning requirements. Let these Foster engineers show you how Fastermatics can help you obtain greater accuracy, increased production and lower machining costs. There is no obligation.

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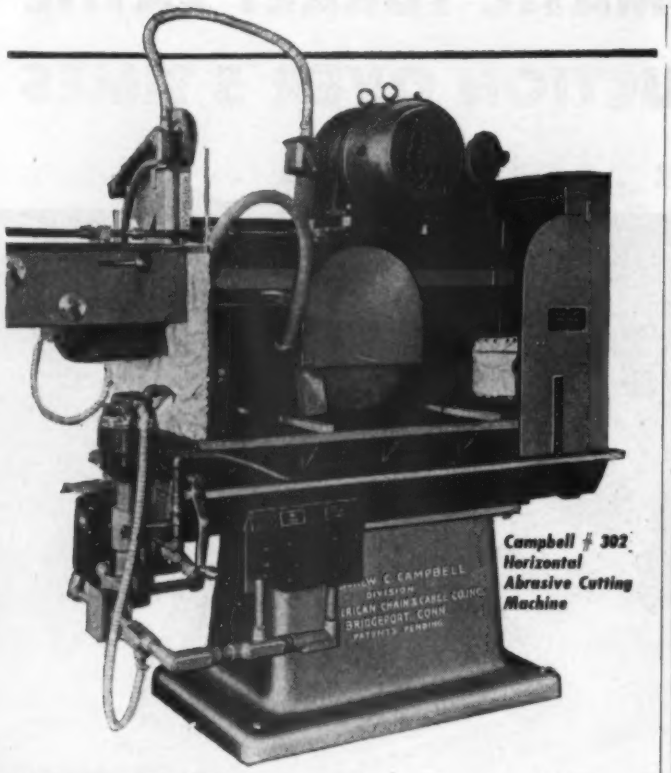

Campbell # 302 Horizontal Abrasive Cutting Machine

CAMPBELL ABRASIVE CUTTING MACHINES HELP MEET LABOR SHORTAGE

• If you cut any of the annealed or unannealed steels, nonferrous alloys, plastics, glass or ceramics—solid bar, tubular or flat stock—a CAMPBELL ABRASIVE CUTTING MACHINE will help you. • Tell the CAMPBELL Engineering Department materials, shapes, sizes, lengths before cutting, lengths of cut off pieces and hourly production required. They'll give you cost data and production procedure without obligation. ***Ask*** for a copy of the CAMPBELL ABRASIVE CUTTING CHART. It shows how the CAMPBELL complete line of Abrasive Cutting Machines can be used to open the way to new highs of production and new lows of cutting costs.

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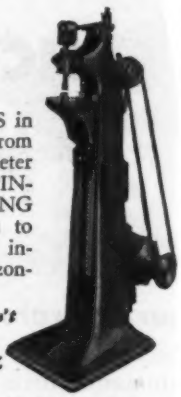
Write for literature and don't forget to send samples.



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for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

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In every shop there is a multitude of small jobs which require prompt and accurate machining . . . die work, models, metal patterns, jig boring, milling, drilling, reaming, etc. It is slow and expensive to schedule them on machines of higher rated capacity.

The LINLEY high speed vertical MILLING and JIG BORING machine is a time saver and money maker . . . and has a surprising capacity for such a small unit. Choice of 8 speeds, 275 to 4250 r.p.m. . . . fast set-up, quick changeover. Direct micrometer setting, velvet feed, no backlash in quill travel, grease-sealed bearings.

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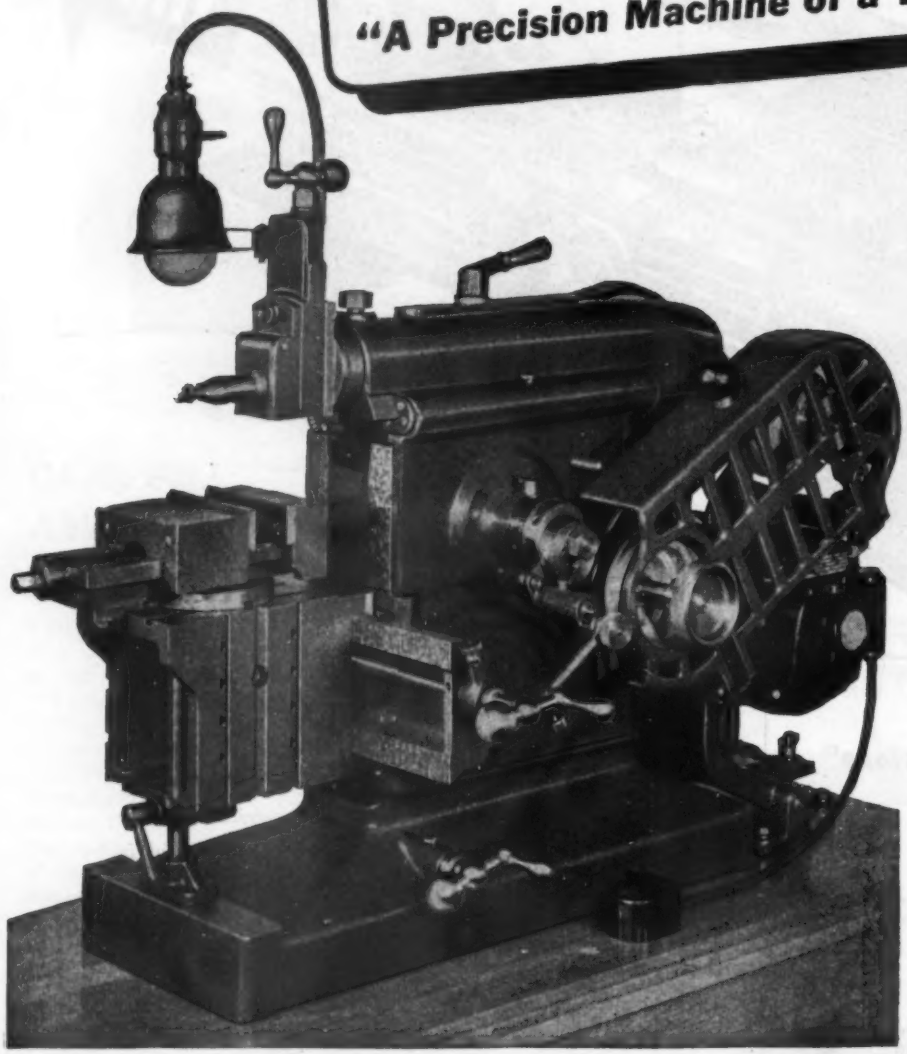
AMMCO
7" SHAPER
"A Precision Machine of a Thousand Uses"



A wide variety of jobs can be done accurately, quickly, easily and economically on the AMMCO 7" Shaper.

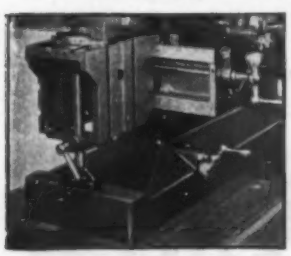
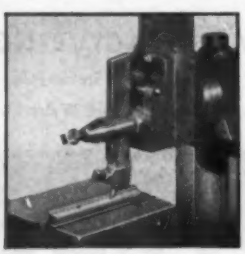
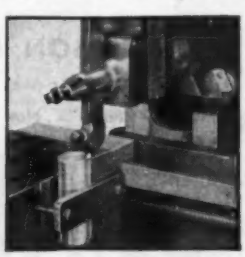
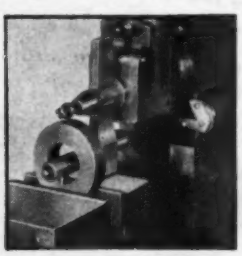
This precision machine has proved itself an essential machine tool for handling exacting jobs in industrial plants, the army, the navy, the marine corps, in mobile machine shops, government agencies, laboratories, tool makers shops, technical schools, etc.

Construction incorporates many features you would expect to find only in larger, more expensive machines... For example: WAYS of ram, tool head, and front face of the main frame are of the "VEE" type, hand scraped to insure accuracy and long life.

Available for stationary installation or as portable unit ...Portable model is mounted on sturdy maple cabinet, and can be rolled from job to job ...Just plug in to an electrical outlet, and go to work. Saves steps and time.

★

Has "VEE" Type Ways . . . Handles a wide variety of work . . . Accurate . . . Portable

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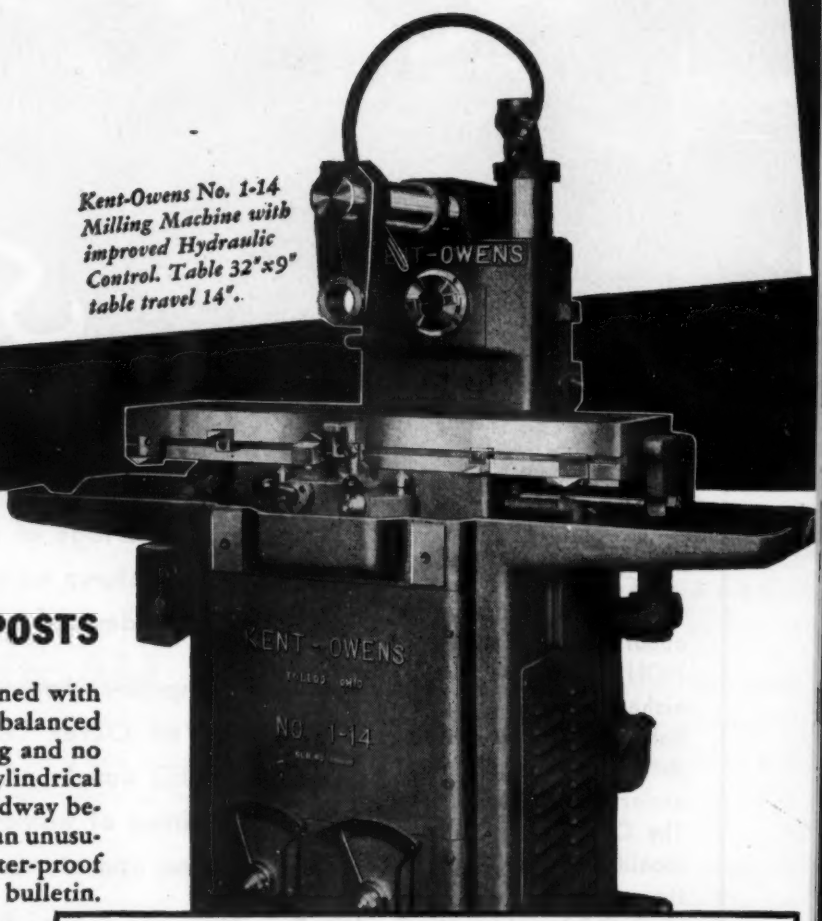
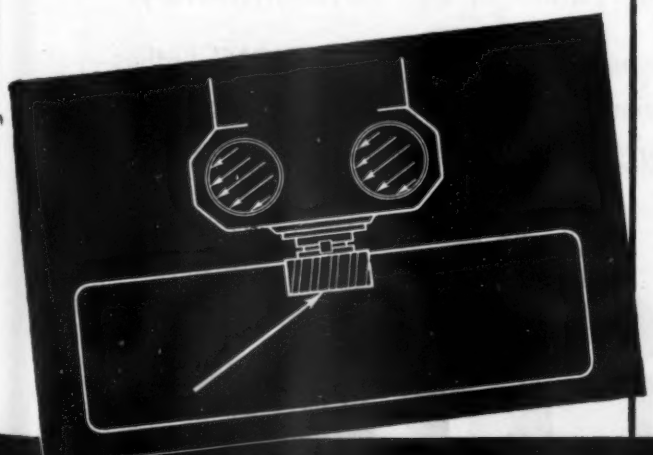


Kent-Owens No. 1-14 Milling Machine with improved Hydraulic Control. Table 32"x9" table travel 14".

Exclusive
MOUNTING BETWEEN TWO POSTS

Only Kent-Owens Milling Machines are designed with the head mounted on twin posts—assuring balanced load in either direction. There is no overhang and no cocking action. The head is mounted on two cylindrical ground steel posts which carry the spindle midway between them. Shop men like its performance—an unusually rigid and accurate machine, practically chatter-proof for either direction of table travel. Send for bulletin.

KENT-OWENS MACHINE COMPANY... TOLEDO, OHIO



THERE'S A KENT-OWENS REPRESENTATIVE NEAR YOU

BOSTON
General Machinery Corp.

BUFFALO
Don W. Patterson

CHICAGO
Neff, Kohlbusch & Bissell

DALLAS
Hamilton-Huster Machinery Co.

DAYTON
Gosiger Machinery Co.

DETROIT
A. C. Haberkorn Machinery Co.

GRAND RAPIDS
Joseph Monahan

HOUSTON
Oliver H. Van Horn Co., Inc.

INDIANAPOLIS
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Eccles & Davies Machinery Company
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SYRACUSE
J. F. Owens Machinery Co.

TORONTO
F. F. Barber Machinery Co.

WALKERVILLE
F. F. Barber Machinery Co.

Call on KENT-OWENS *for Milling Machines*

MEMO

Complete information about Oster "RAPIDUCTION" Lathes will be furnished promptly but no definite commitments on delivery dates can be made under existing conditions. The Oster dealer in your locality will advise you of the current status of delivery schedules at any time.

A critical shortage of highly skilled operators was faced by a manufacturer with large contracts for aviation valve stems and guides and other contracts for 20 mm. projectiles.

The "manpower shortage" was overcome by installing a battery of Oster "RAPIDUCTION" Lathes whose SIMPLIFIED construction and operation made possible rapid training of women with little or no prior experience as machine operators.

Results were stated by the owner of those Oster "RAPIDUCTION" Lathes to be *"Very Satisfactory."*

Wartime performance of Oster "RAPIDUCTION" Lathes forecasts a peacetime demand for Oster-engineered equipment designed for fast, accurate machining at low cost.

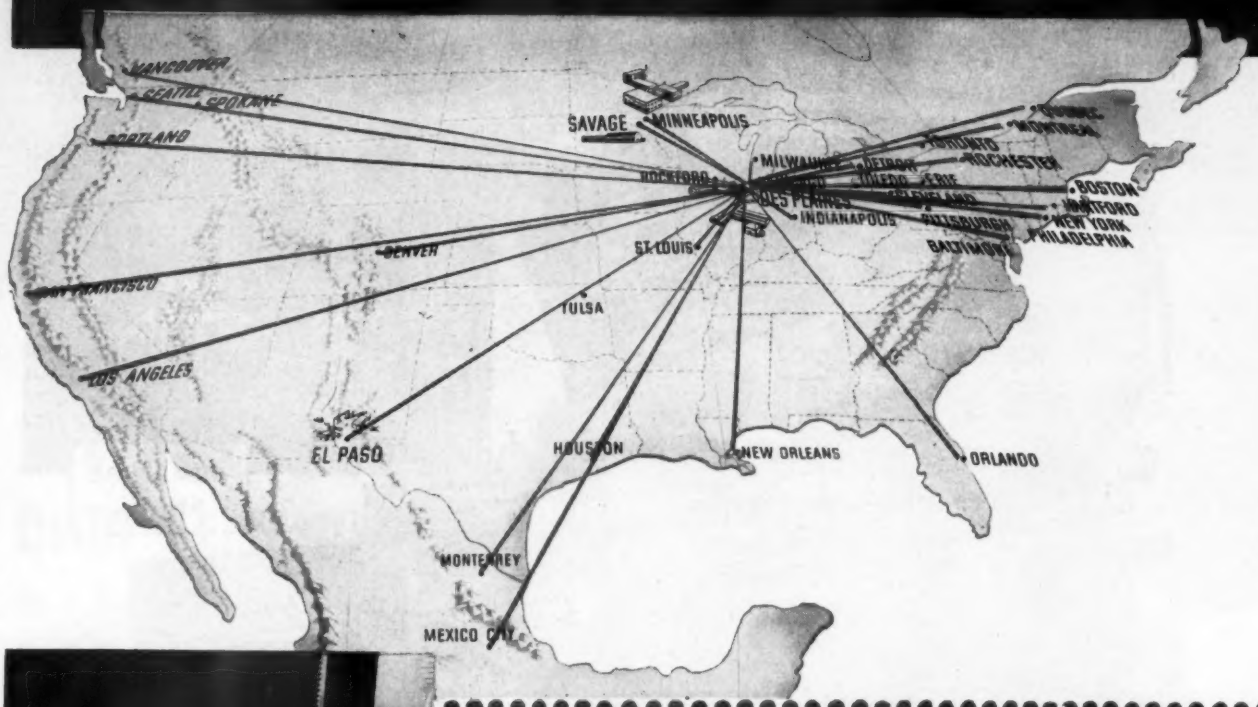
OSTER

"Rapiduction" LATHES

THE OSTER MANUFACTURING COMPANY, 2049 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

AROUND THE U.S. with DoALL

Fastest Metal Cutting Method



DoALL Contour Sawing has won top place in American metal working plants everywhere. It's the modern cutting process for all kinds of internal and external metal shaping—does hundreds of shaper, lathe and miller jobs in a fraction of the time.

And, whether you need saw bands or help on cutting certain materials or shapes, you'll find a factory trained man in every key point shown above, with complete DoALL supplies in stock; i.e., band saws, band files, polishing bands, grinding wheels, cutting oils, etc.

DoALL PRODUCTS BOOKLET— Write for copy. It presents the complete DoALL line.

DoALL

THE DoALL COMPANY
201 N. LAUREL AVE. DES PLAINES, ILL.

ACCURACY AT LOW PER-PIECE COST

● The Model LR Lo-swing has demonstrated its ability to cut costs on a wide variety of work demanding consistent accuracy at high speeds. Its field includes practically any work within its capacity, and up to 46" between centers in the longest bed length. It is designed to provide maximum efficiency with carbide tools.

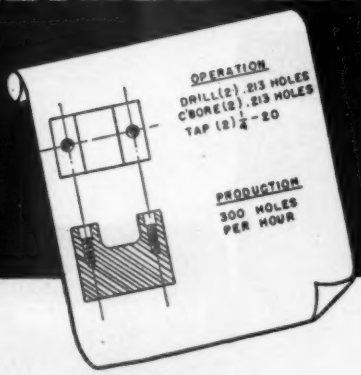
Model LR is a versatile lathe in that it may be equipped with either direct V belt drive to the spindle for high speed, fine finishing cuts, or a geared drive with pick-off gears for slower roughing cuts. It may also be equipped with a third slide (over-head) as well as additional back squaring attachments, carriages and carriage slides, making for innumerable tooling possibilities.

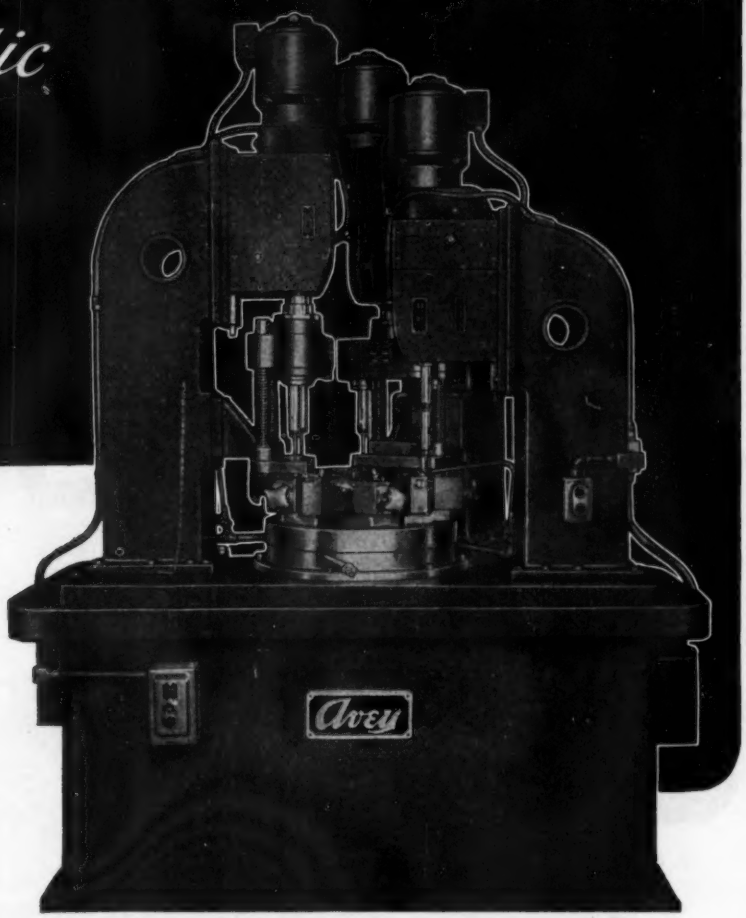
Write for Bulletin on this modern, automatic lathe. Send in your blueprints for estimates.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS *from* SENECA FALLS

Avey Automatic METHOD No. 4





THE Avey CAM FEED UNIT

No. 1 Size—1/2" capacity in cast iron.
No. 2 Size—7/8" capacity in cast iron.

designed for multiple operation on individual holes--drilling, counterboring (reaming or redrilling) and tapping at one clamping of work

Accelerated production obtainable by free loading time and multiple operations on several parts simultaneously in normal time required for one operation.

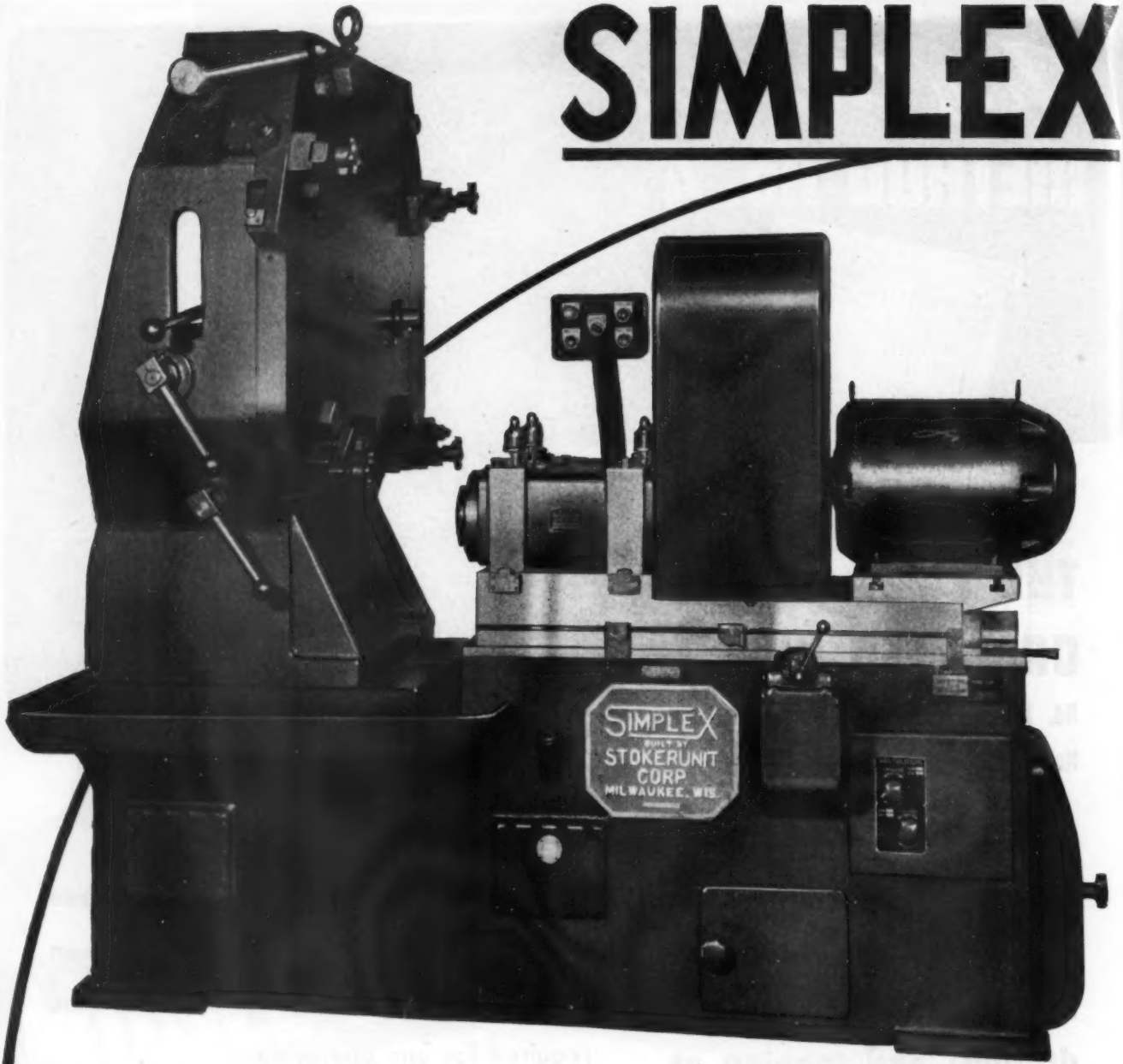
Method No. 4. Lower cost per part—higher production per capital investment—greater accuracy by semi-skilled operators delivering high quality production speedily, accurately, efficiently with a minimum of supervision.

THE AVEY DRILLING MACHINE CO.
CINCINNATI • OHIO • U. S. A.

ARMY E NAVY

Avey DRILLING MACHINES

SIMPLEX



Precision Boring Machines

Did you know that precision boring has grown up? It is no longer confined to jobs you can carry around in your hat. Today pieces as large as your desk are being precision bored for military purposes. Tomorrow similar pieces will be precision bored for commercial purposes. Now is the time to be considering these applications in your own plant.

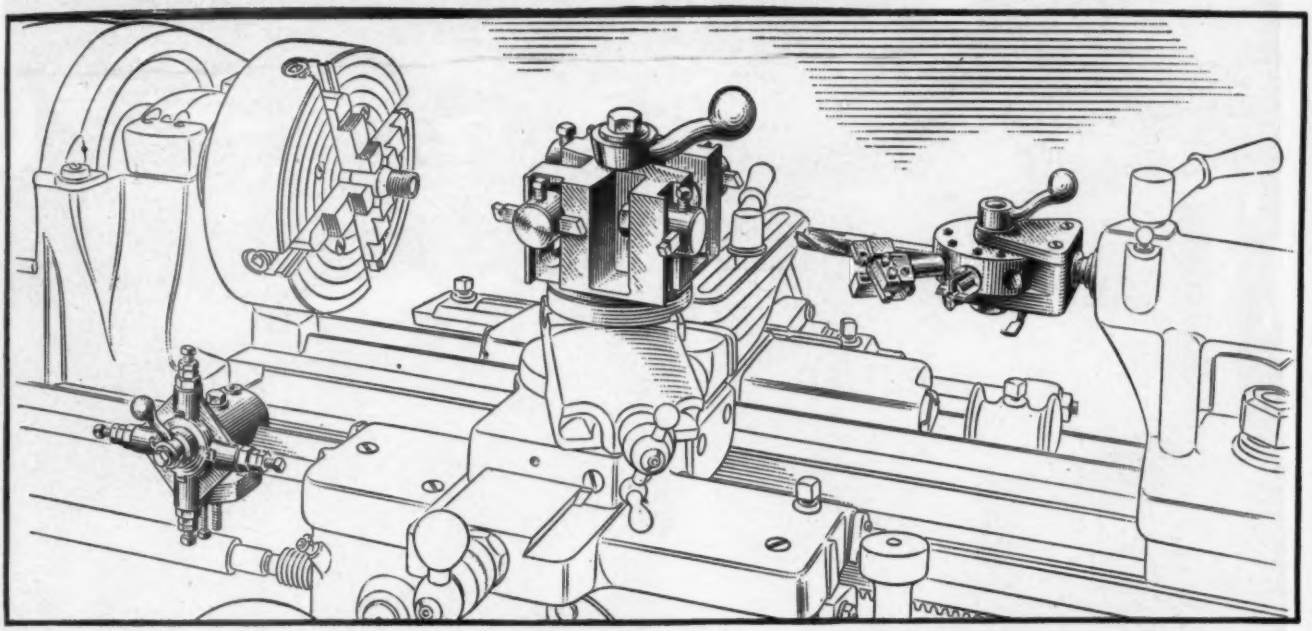
The machine shown above is one model. Other larger and more versatile units have been built and more are coming. Our catalogue will give you a more general picture. Our dealers will help answer your specific needs. Ask for our catalogues on your letterhead, without obligation. Our engineering surveys are available for your problems.

STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4524 West Mitchell Street, Milwaukee 14, Wisconsin

To convert engine lathes into turret lathes...



Here's all you need...

CROSS-SLIDE TURRET — for multiple machining operations on the same lathe. Gives you four different working positions without tool changes. No. 30 for 9" to 11" lathes; No. 60 for 12" to 18" lathes.

TAIL-STOCK TURRET— quickly converts engine lathe into 4-way turret lathe for end work. No. 58 with No. 2 Morse Taper Shank; No. 103 with No. 3 Morse Taper Shank; No. 104 with No. 4 Morse Taper Shank.

LATHE STOP—you measure only once for each operation, thus saving valuable time. Once the four measuring positions are set, you just index. No. 10 for 9" to 12" lathes; No. 20 for 13" to 20" lathes.

With these three SPECIALTIES lathe accessories attached to your engine lathe, you can do any kind of work—forming, roughing, boring, finishing, drilling, tapping—without stopping the lathe or changing tools.

A SPECIALTIES Cross-Slide Turret, Tailstock Turret and Lathe Stop convert any engine lathe into a complete, accurate turret lathe, multiplying the productive capacity of your machine many times.

See for yourself how easily, and quickly, you can take advantage of this SPECIALTIES production team designed to speed output of vital war material, increase efficiency, and cut machining costs. Mail the coupon for full details.

SPECIALTIES Manufacturing Co., Inc.
48 Farrand Street, Bloomfield, N. J.

Please send me full information on SPECIALTIES lathe accessories.

Name_____

Company_____

Address_____

City_____ State_____

SPECIALTIES
MANUFACTURING COMPANY, Inc.

Here go some more of those exceptionally good Wade Lathes to speed up Precision Production

You, too, Can Increase Your Output and Get Greater Accuracy with Wade Toolmakers' Precision Lathes

THE Wade Model 8-A Toolmakers' Precision Lathe is the choice of so many manufacturers because it helps speed up production by enabling men to work faster, with greater accuracy and with less spoilage. Operators can get a larger daily output because all control and operating features are carefully worked out for efficient handling of the work.

You can get faster and more accurate production on this lathe because it is carefully designed and built with features that give it extreme accuracy for precision work. These close tolerances are possible: Thread cutting operations: Overall error in lead will not exceed plus or minus .0005" per foot. General turning operations: Accuracy within .0003" over a distance of any one foot. Facing: Will check within .0002" concave and .0000" convex on an 8" face. You can depend on Wade Precision Lathes for precision, versatility and stamina.

Wade

Bench Lathes and Profilers For Precision, Versatility And Stamina

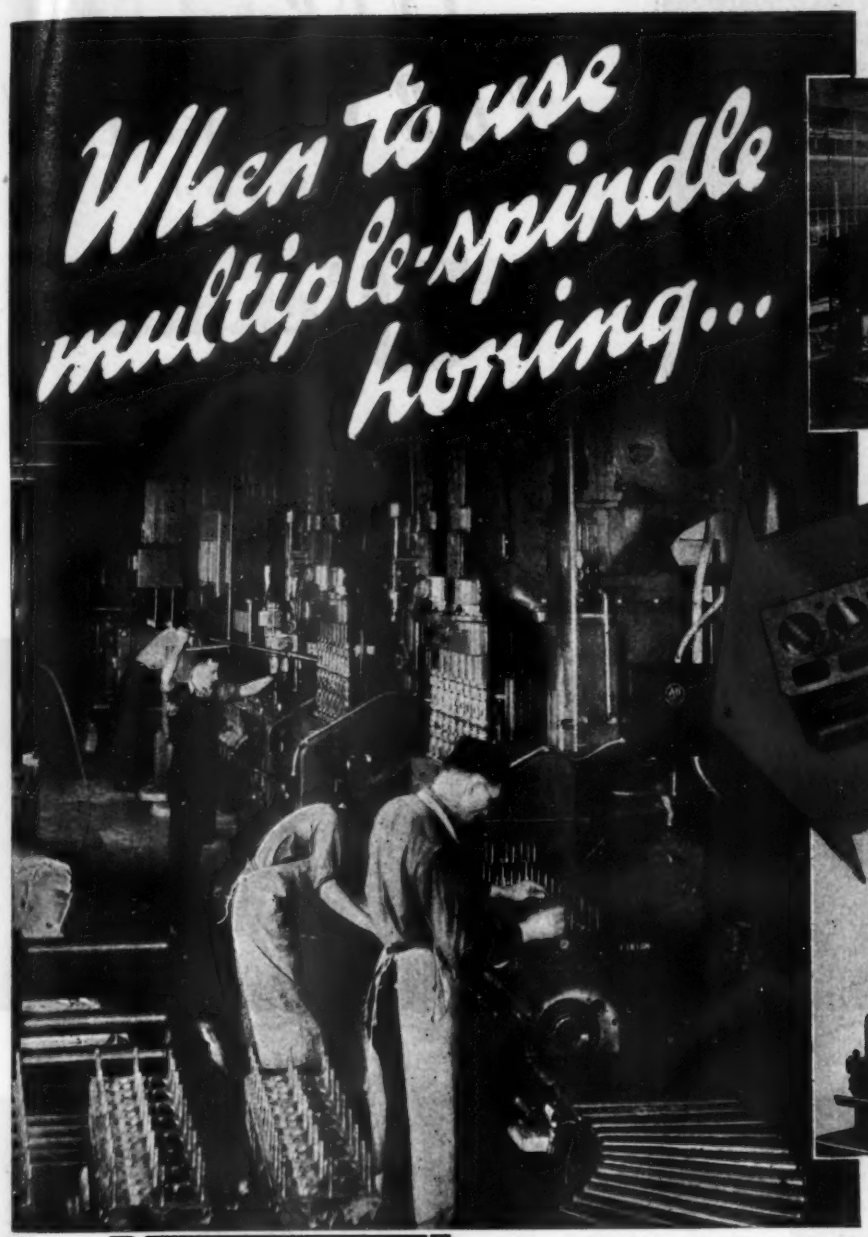
Write today for catalog

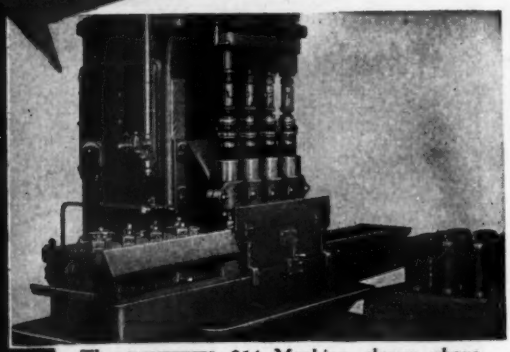
THE WADE TOOL COMPANY

WALTHAM 54, MASSACHUSETTS

When to use multiple-spindle honing...

(Below) This battery of BARNESDRIL Single Spindle Machines on aircraft cylinder assembly line hones nitrided barrels (Hardness 65 Rockwell "C") to limits of .0005" and finished to 2.5 micro-inches.





The BARNESDRIL 214 Machine, shown above, gives multiple honing advantages to individual parts. Special holding fixture has spare station which is reloaded during honing time.

BARNESDRIL ENGINEERS WILL FIND THE ANSWER IN YOUR PART DESIGN AND PRODUCTION REQUIREMENTS

The design of your part and your production requirements determine whether or not multiple honing is the most practical solution to your internal finishing operation.

On jobs where production requirements are high, like the finishing of bores of this 8-cylinder block, shown above, BARNESDRIL Multiple Spindle Honers are paying for themselves in time savings. Two machines are used, the first for rough honing, and the second for mirror finish honing. The bores of the block are honed simultaneously by the 8 spindles of the Multiple Honer. Production is approximately 100 blocks per hour, whether 8, 6 or 4-cylinder blocks.

Where high production is required on individual parts, such as tractor sleeves, more than one part can be honed simultaneously on a Multiple Honer like the BARNESDRIL No. 214 Machine shown right above. Special fixtures designed to hold more than one part enable the operator to hone several parts in one operation.

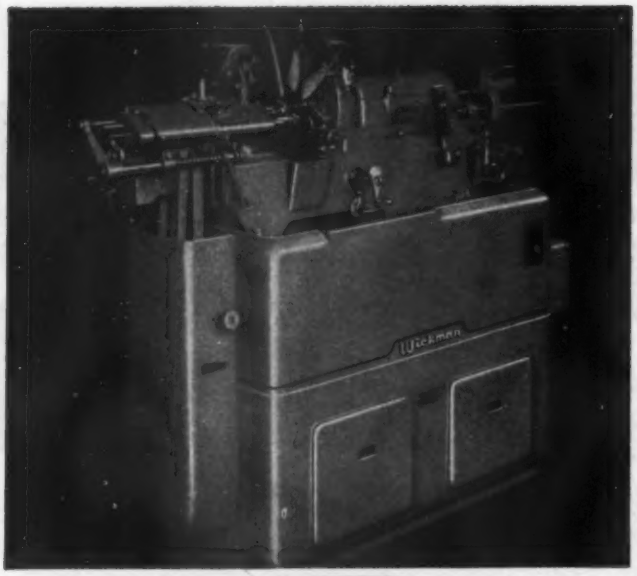
Less specialized honing applications where production does not warrant the use of a Multiple Spindle Honer can be handled satisfactorily with the BARNESDRIL Single Spindle models.

Submit your internal finishing problems to BARNESDRIL Engineers. The men who pioneered the field of honing machinery will study your part and recommend the machine best suited to your part design and production requirements. There is no obligation.

GET THIS FREE DATA—Bulletin No. A-121 describes the honing process and gives complete descriptions and specifications of the BARNESDRIL Honing Machines. Write for your copy today.

Barnes Drill Co.

830 CHESTNUT STREET
ROCKFORD
ILLINOIS, U.S.A.



INCREASE VERSATILITY of the

Wickman

No. 2

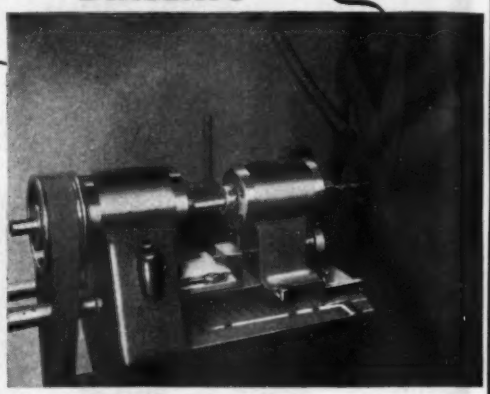
Swiss Type Automatic

With These Attachments

THREE SPINDLE

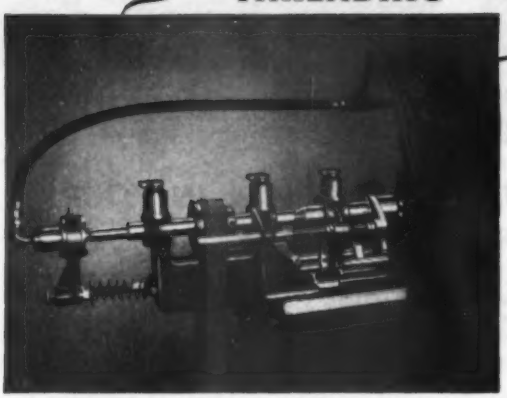
The Three Spindle Attachment provides a means for centering, drilling, reaming, threading and tapping parts produced on the Wickman No. 2 Automatic. The third spindle, which is used for threading, overruns the machine spindle to provide smooth operation without slowing the machine spindle.

DRILLING



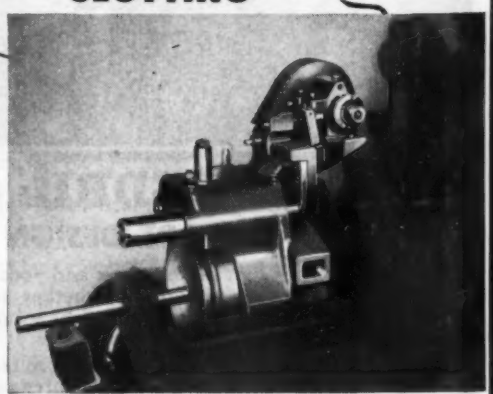
The High Speed Drilling Attachment provides for drilling and reaming operations. The spindle revolves in the opposite direction from the machine spindle to provide high surface speeds with small drills.

THREADING



The Revolving Die Head Threading Attachment is used to chase threads on parts being produced in the Wickman No. 2 Automatic. The Die Head overruns the machine spindle so that precision threading can be done without slowing down the machine spindle.

SLOTTING



This attachment picks the part up as it is being cut off and carries it to a slotting saw. This attachment is independent of the machine and may be used in conjunction with any other attachment.

Although a taper can be generated by a combination of tool and headstock movements, where extreme accuracy is required a taper turning attachment can be supplied. This attachment transfers the taper directly from an accurately ground form-bar to the No. 1 tool.

All Wickman attachments are easily interchangeable and will fit any Wickman No. 2 Swiss Type Automatic.

WICKMAN HIGH PRECISION AUTOMATIC

THE Wickman CORPORATION

15539 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

BAKER

3½ x 24

—TWO-WAY HYDRAULIC FEED MACHINE—

bears down on a tough job

ARMY E NAVY

This latest in the series of BAKER machines is handling operations including rough boring, straighten boring and chamfering main and counter-shaft bores in the production of Army transmission cases.

The machine illustrated combines BAKER's 3½ x 24 floor type hydraulic feed unit mounted to right and left of a special center bed — on which is mounted a special BAKER-designed work holding fixture.

Important among the special features are:

Feeding saddle mounted on nitralloy bars, permitting long service with minimum wear — automatic cycle of rapid traverse feed and return — pick off gear head on saddle provides pick off speed change gears — each head arranged with special two spindle fixed center multiple head (furnished by BAKER) — all equipment, including electric controls, supplied by BAKER.

In designing BAKER units future usefulness is given serious consideration . . . and this machine is adapted to war *and* peacetime production.

Consult BAKER today on your special problems. If we're unable to supply a standard BAKER unit for the job we'll design it!

BAKER BROS., INC.

TOLEDO OHIO DRILLING · BORING & TAPPING UNITS

EXAMPLE: Edge-Grinding Armor Plate to .005" Tolerance*

Series 4000 Hanchett Hydraulic Traveling Table Face Grinder in operation at McInerney Spring & Wire Co., Grand Rapids, Mich.

No. 900 Traveling Table Face Grinder

In the above illustrated example of edge-grinding armor plate for welded tanks and combat cars the Hanchett 4000 Traveling Table Face Grinder is doing a job accurately to .005" tolerance and consistent with the time demands of a speeded war effort. * *In many instances tolerances of .0005" are maintained on a production basis.* For continuous, trustworthy performance this machine cannot be outperformed for the job it is doing day and night through long grueling hours of production punishment.

Made in five sizes, this machine has range to finish hundreds of jobs, large or small. Operators like its handling ease and time-saving centralized controls, always within reach. For full information on Hanchett Traveling Table Face Grinders, write for Bulletin 170A-11.

Series No.	HP	Wheel Size	Table Width
900	40	36"	24"
1000	30	30"	24"
2000	25	30"	22"
3000	20	24"	22"
4000	15	20"	20"

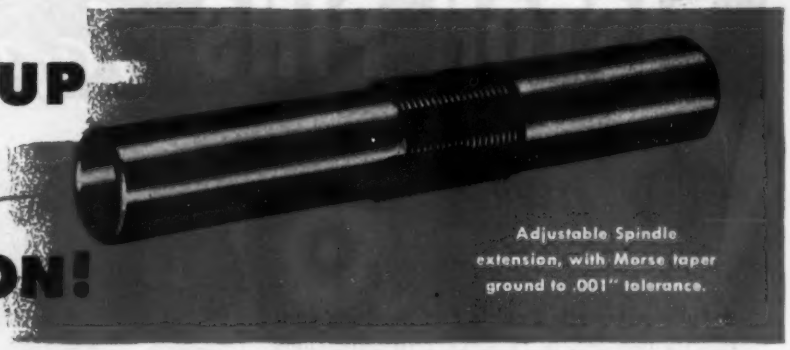
Table lengths: 50 inches to 24 feet.

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.
BIG RAPIDS, MICHIGAN U.S.A.

Quick SET-UP PLUS HIGH PRODUCTION!



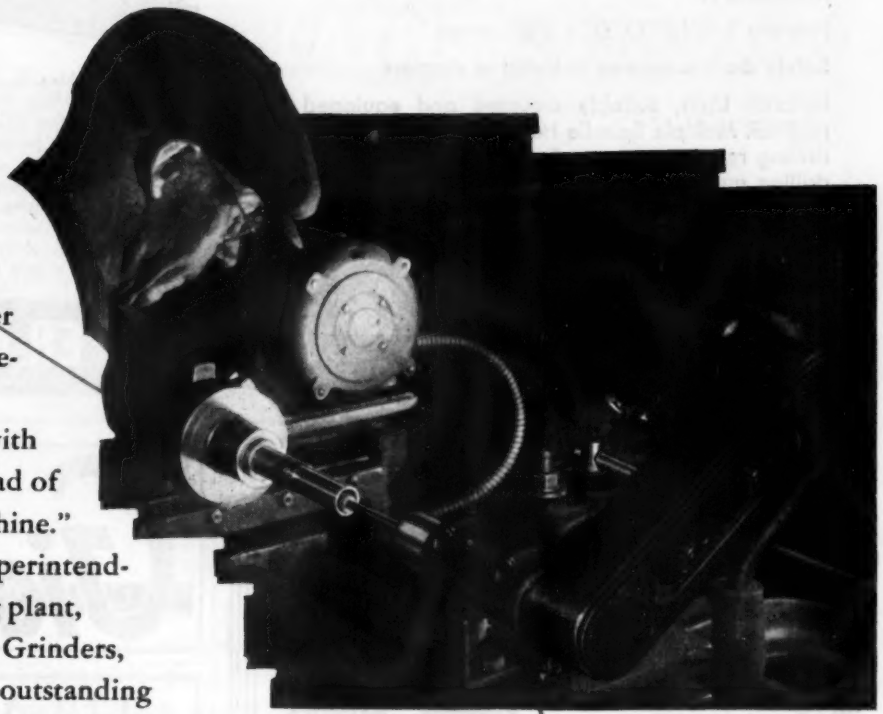
Adjustable Spindle extension, with Morse taper ground to .001" tolerance.

MILLING MACHINE BECOMES VERSATILE PRODUCTION GRINDER WITH AID OF A DUMORE!

"What advantages do you gain from using the Dumore grinder on these parts," we asked.

"High speed with precision, both important on small diameter holes, plus easy and quick change-over from one piece to another. We can grind almost any piece with a minimum of adjustments, instead of practically tearing down the machine."

That's the reply of the shop superintendent of a large tool manufacturing plant, where nearly a hundred Dumore Grinders, variously mounted, are doing an outstanding job of production grinding on small parts. Like many another plant, faced with increased demand coupled with a shortage of machine tools, this firm solved the problem by combining the Dumore with an available machine tool base. In this way, they obtained production grinding equipment capable of a wide range of work at a tolerance of ± .0001" although this particular job requires only .001" accuracy.



Milling Machine base, with No. 7 Dumore Grinder, grinding Morse taper on inside diameter, to .001". Readily available for external grinding by change of quill, wheel, and pulley combination.

Have you explored the full possibilities of the Dumore in your set-up? Catalog 42 contains a fund of helpful suggestions. Write today for your copy to The Dumore Company, Tool Division, Dept. TJ14, Racine, Wisconsin.

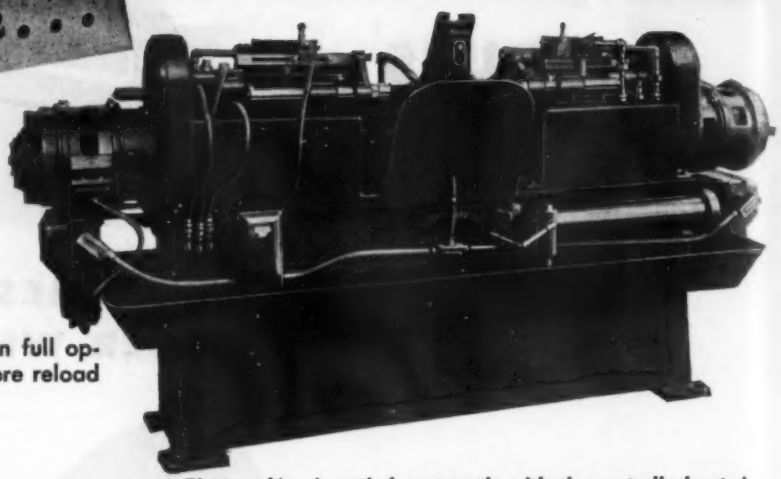
DUMORE

PRECISION AND OFF-HAND GRINDERS

SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES

PISTON PINS *Taper* REAMED

6 per minute . . .



★ Fully automatic Double End Machine containing two 3-h. p. HOEFER Hydraulic Units and a special hydraulic fixture. Taper reams six piston pins per minute, both ends.

The operator fills hopper and machine handles pieces automatically. The hopper is in full operation for 10 minutes machining 60 pins before reload is necessary.

Pins are 1-1/16" O. D. x 3⅝" long.

Safety devices prevent collision of reamers.

HOEFER Units, suitably mounted and equipped with HOEFER Multiple Spindle Heads, meet every production drilling requirement at a fraction of the cost of special drilling equipment.

Let us give you more details on this equipment — its immediate application to today's needs and its advantages for post war production.

• This machine is entirely automatic with the centrally located hydraulic holding fixture, operated by a separate motor, interlocked with the HOEFER Units, with the following work cycle:
1—Jaws open, permitting pin to enter from chute.
2—The jaws close automatically, starting work feed.
3—The two horizontal spindles approach the work of rapid traverse, changing to work feed as reaming begins.
4—Spindles withdraw at rapid travere.
5—Jaws open, permitting finished piece to drop out.
The operator's only duty is to keep the work chute filled.

Hoefer's Whole Business is Holes . . . .

HOEFER MFG. CO. *Freeport, Ill.*

LM

REID All Electric Automatic Feed Surface Grinder No. 2B

Equipped with Motorized Spindle

Our dealers will help you fill out necessity priority forms. Write us today for your nearest dealer's name and address.

A Proven Product for Over a Quarter Century with Thousands in Use Daily

Send for Descriptive Literature
EXCELLENT DELIVERIES

Exclusive Selling Agents

H. LEACH MACHINERY CO.
387 CHARLES ST. PROVIDENCE, R. I.
Agents in all Principal Cities Throughout the World

For cutting internal keyways, slots or splines 1/16" to 4" wide and up to 60" long. Fast—Accurate—Flexible. Write for particulars and catalog on machine for your work.

Giant KEYSEATERS

MITTS & MERRILL
913 Tilden St.
Saginaw, Michigan

LUCAS "PRECISION"

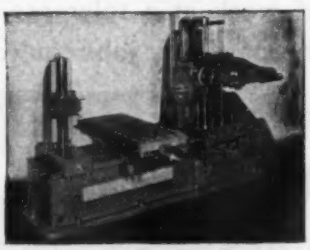
Horizontal Boring, Drilling and Milling Machine
THE LUCAS MACHINE TOOL CO.

NOW AND ALWAYS OF

CLEVELAND
OHIO, U. S. A.

UNIVERSAL *Horizontal Boring Machine*
The only TRIWAY *Boring Machine Built*

Made in 3" and 4" spindle sizes. Write for complete, detailed specifications.

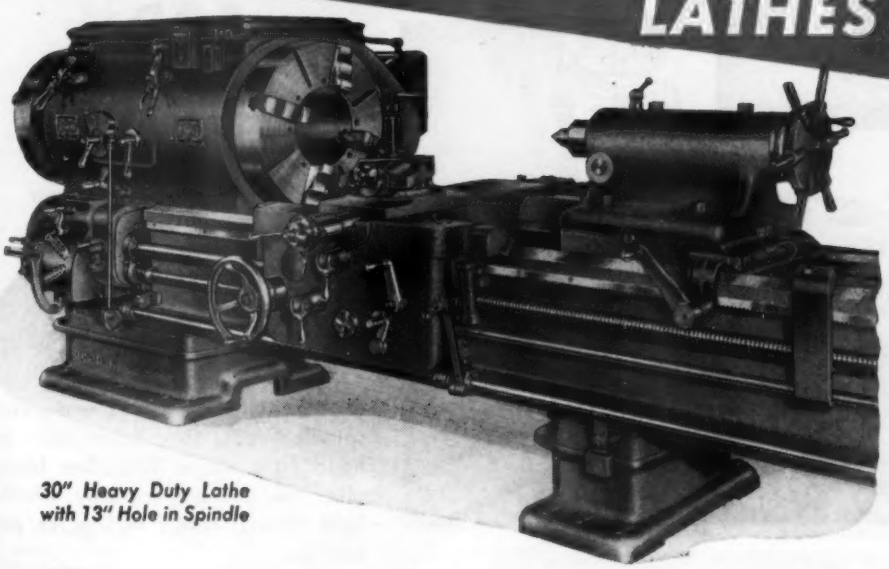


Standard Universal 3" Spindle Machine

UNIVERSAL BORING MACHINE CO.
Hudson, Mass., U. S. A.

Increase Production–Do Better Work–Save Man-Power and Materials!

with HYDRATROL LATHES (LARGE HOLLOW SPINDLE TYPE)



30" Heavy Duty Lathe with 13" Hole in Spindle

5 sizes-18" to 36"

Small, 18" up to 7-1/4" Hole
Medium, 24" up to 12" Hole
Large, 27" up to 13" Hole
Large, 30" up to 14" Hole
Large, 36" up to 16-1/2" Hole

(Standard Type lathes, 16" to 36")

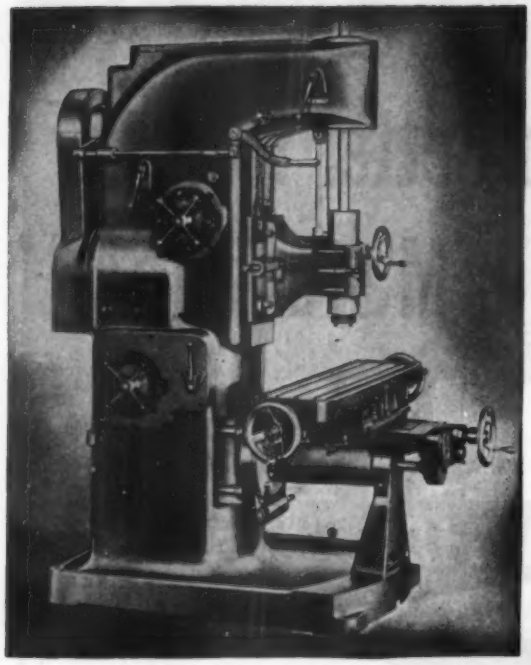
Shop after shop is finding that it can do many machining jobs considerably *better* with a *Large Hollow Spindle Type* of HYDRATROL LATHE. Shop after shop is finding that the savings which result are enough to pay for the new lathes in a comparatively short time.

Look around your own plant—you may find a number of machining jobs which are a problem to you—jobs which possibly could be done *better* on a Large Hollow Spindle Type of HYDRATROL LATHE. Send us prints of these difficult, unusual or too-costly jobs, for a specific, time-and-money-saving recommendation.

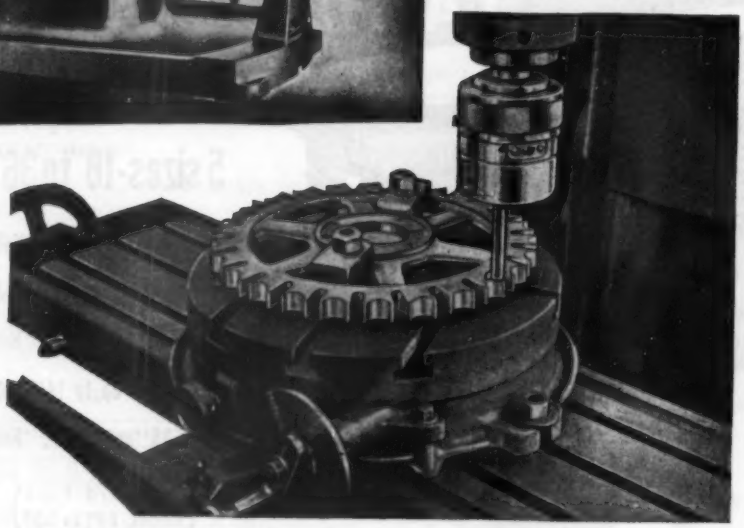
"Our Large Hollow Spindle Type of Hydratrol Lathes Are the Best Investment We've Made in Years!"

Lehmann MACHINE COMPANY

CHOUTEAU AT GRAND · ST. LOUIS 3, MO.



THE VERSATILE ALL-PURPOSE KNIGHT Miller EQUIPS YOU FOR UNUSUAL CAPACITY



You get that all important "ACCURACY"

The geneva cam in this picture illustrates a typical job requiring accurate milling, boring, and spacing. The slots between the cam tracks held to be the same width and depth, the cam tracks all the same radius, and the spacing from center to center of each exactly the same. This was done quickly as well as accurately on a KNIGHT Miller equipped with indexing rotary table.

- ★ Speed and Accuracy for light milling
- ★ Power and Rigidity for heavy cuts
- ★ Difficult and Unusual Parts handled quickly and accurately without special equipment
- ★ Limited and Special Production done economically and quality maintained without special tooling
- ★ Internal and External Milling done at one setting

● The KNIGHT Miller's wide range of spindle feeds, solid table unit, ease of handling combine with other features to give you unusual capacity whether for light milling, heavy milling, or precision boring.

These milling machines will perform and produce at any of their speeds and feeds to the full capacity of the motor installed.

Capacity too is realized because of the short time necessary for making set-ups even though they are difficult ones. Additional set-ups in most cases are eliminated — some are greatly simplified.

There is quick and accurate location of holes and surfaces—particularly so when dial indicators are used. To change vertical settings you simply move the spindle rather than the work. Added to all this is the fast method of changing cutting tools.

To get the full story on the fast, compact, complete, and convenient-to-handle KNIGHT Miller, write for catalog.

KNIGHT VERSATILE MILLERS ACCURATE · RIGID

IMMEDIATE DELIVERY SUBJECT TO PRIOR ORDER

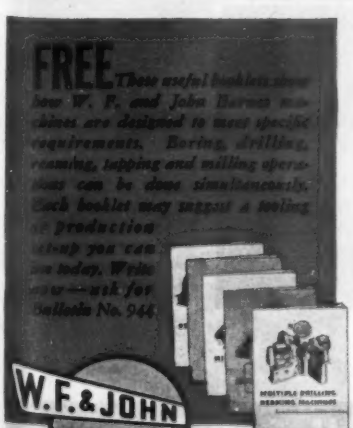
W. B. KNIGHT MACHINERY CO.
● ST. LOUIS, MISSOURI ●

W. F. and John Barnes machine equipped with tool heads and fixtures designed by user. Cylinder block is shown positioned for drilling.

Two cylinder blocks showing holes on the water side which have been drilled and tapped. Holes in top and bottom of block are also shown.

1280 more Cylinder Blocks per Month . . ENGINEERING

COLLABORATION BETWEEN MANUFACTURER AND USER PRODUCES MACHINE WHICH MORE THAN DOUBLES PRODUCTION



● Here is an interesting example of how a large motor manufacturer collaborated with our engineers in designing and building special machine tools to suit their job. As a result, cylinder block drilling was increased from 720 blocks per month to 2,000 blocks per month. In addition to increasing production, one Barnes machine with one operator replaced six single spindle drilling machines.

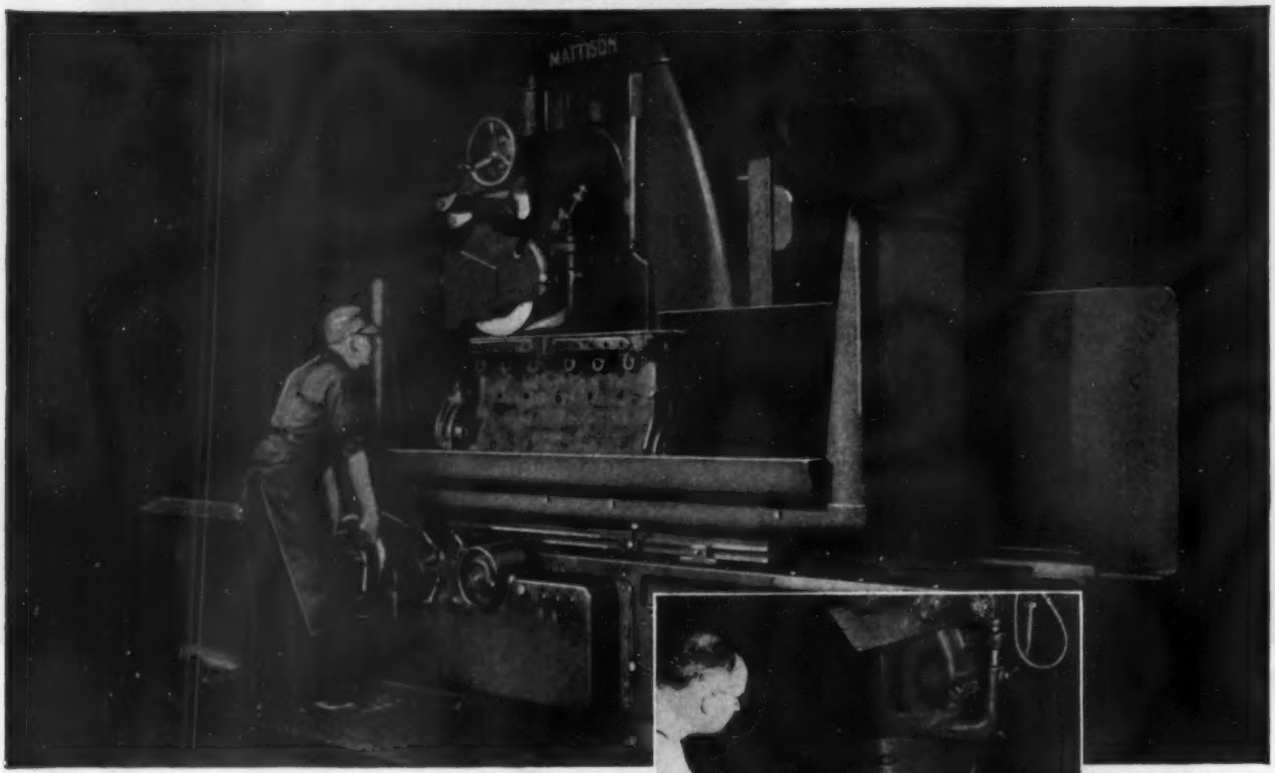
This manufacturer uses three Barnes machines in his production line. Drilling and tapping heads on these machines are of his own design. One machine drills holes on both water side and valve side simultaneously. The second machine is used to tap all holes on both sides of the block, except the angular holes. The third machine taps all holes on top and bottom of block. Roll conveyors and small power hoists are used to handle the blocks from one machine to the other.

You may be confronted with similar problems. Our designers will be glad to collaborate with you in designing a machine for your needs. Submit your machining problems to us for recommendation. There is no obligation.

W. F. and JOHN BARNES

310 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

PRECISION AND PRODUCTION ON VARIED JOBS WITH MATTISON GRINDER



Gasket face of Diesel cylinder block ground to absolutely smooth finish and accuracy of a few tenths — Cylinder head also ground in like fashion. When matched together, the parts make an absolutely tight joint, required by the excessive pressure of Diesel-type engines.

← Mattison Grinder doing "tenths" job on airplane part.

Spindle block carries → milling machine spindle, and accordingly is a most important unit. Ground 4 sides to exacting specifications in order to assure perfect alignment in uprights to which they are mounted.

← These Gear Cases ground 2 sides in 30 minutes. Previously hand scraped requiring 4 hours per piece.

● These are but a few of the many jobs which Mattison Surface Grinders are capable of handling — The large size and capacity makes it possible to grind one large part weighing up to several tons in weight, or many small parts, with equal speed and facility.

In all sizes from 12″ to 36″ wide to 192″ long, Mattison Surface Grinders are ruggedly built to do high-powered precision grinding, saving time and maintaining accuracy in an extremely wide range of jobs.

A free booklet will be sent showing further examples — write today for your copy.

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ROCKFORD · ILLINOIS

More Than Double Drill Life

Eight Times More Holes per Grind

Over 90% Saving in Drill Cost

TYPE 4-G . . . CAPACITY UP TO 2" DIA. ON 2, 3 OR 4 LIP DRILLS

SELLERS DRILL GRINDERS

re inherently accurate in that they elimi-ate human and mechanical errors . . . lways grinding correctly formed points ith identical angles and length of lips. nskilled labor quickly learns to pro-uce free cutting accurate drills that operate at the most efficient speeds with increased number of holes per grind—holes that require no "doctoring" . . . Write today for complete data on these modern production tools.

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1610 HAMILTON STREET
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TYPE 1-G MOUNTED ON TOOL CABINET . . CAPACITY FROM .028" TO ½" DIA.

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Describes the use of master samples, method of processing gear blanks of same width, different diameters, etc.

3. Turning in Lots of 4 to 200
Describes the ingenious method of turning and boring 1000 different sizes and types of bronze bushings.

Here is proof of the productive versatility of the Sundstrand Automatic Lathe. The facts and data presented in this new book are taken direct from the field—checked and re-checked for accuracy and presented to you so that you may compare the performance of your present lathe equipment with the outstanding performance obtained by Sundstrand Automatic Lathes in other plants.

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ARMY (E) NAVY

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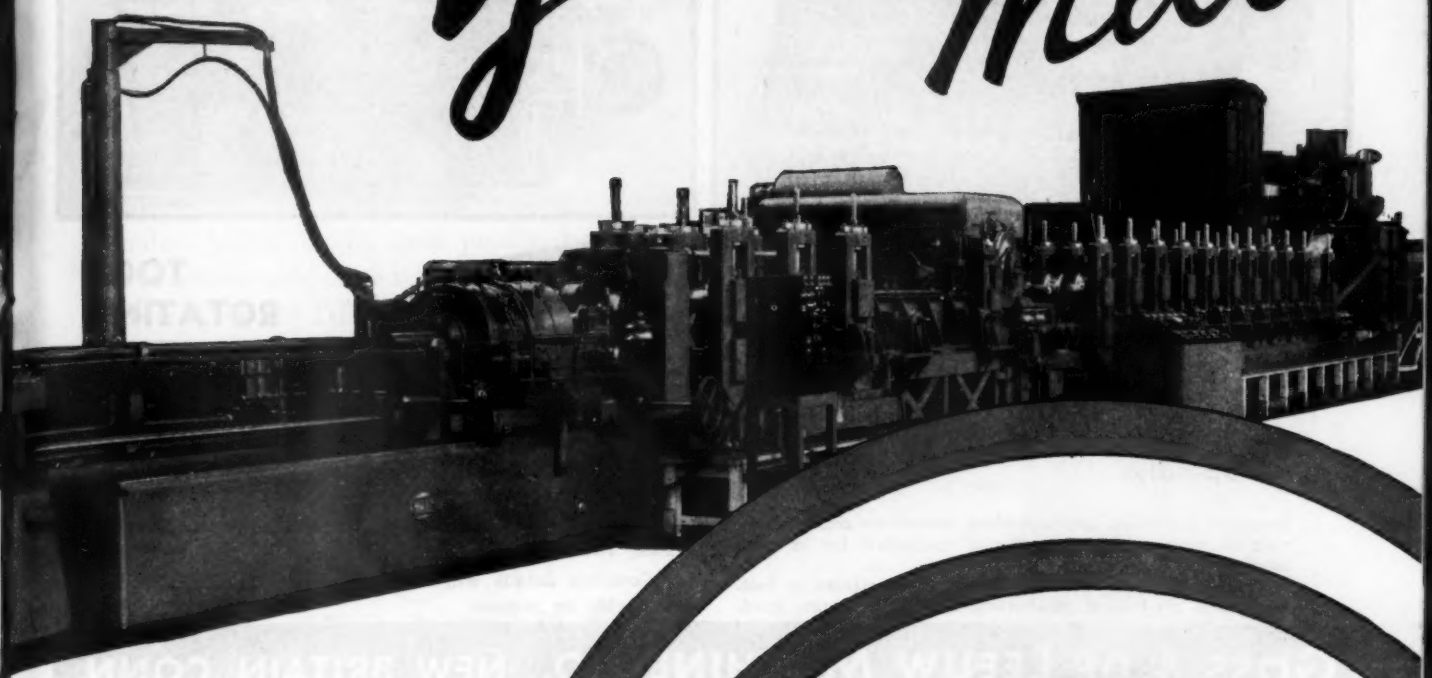
Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2533 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

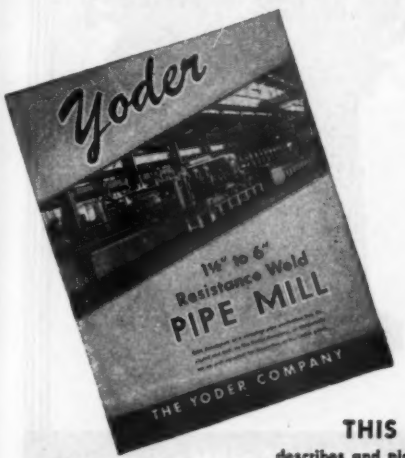
This Yoder Mill



MAKES RESISTANCE WELD STEEL PIPE OR TUBE IN

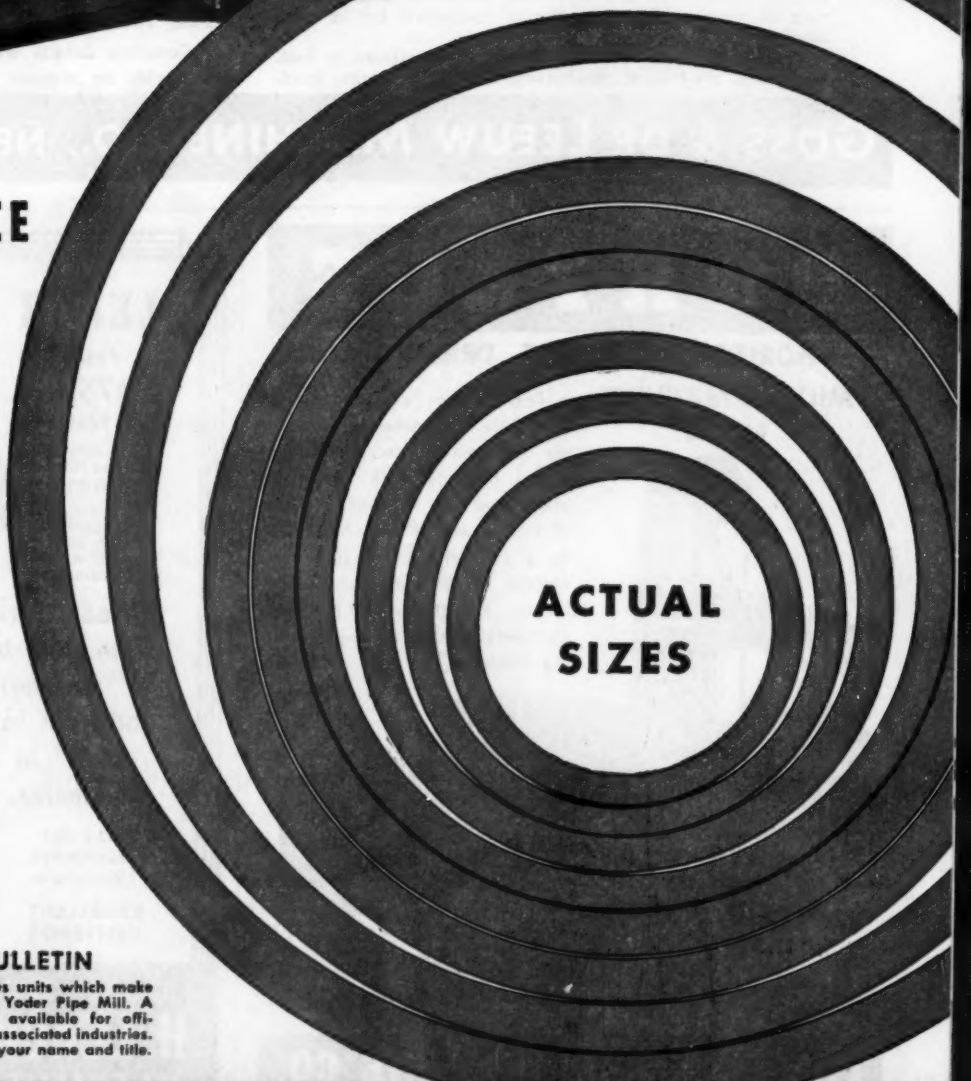
THESE SIZES

from continuous strip stock



THIS BULLETIN

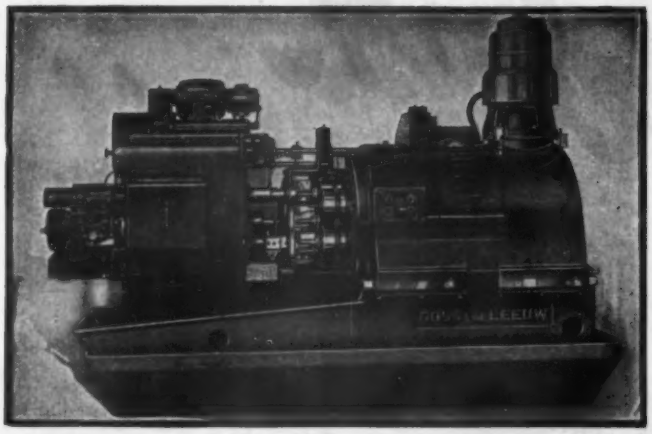
describes and pictures units which make up a 1½ to 6 inch Yoder Pipe Mill. A limited number still available for officials or engineers of associated industries. Please write, giving your name and title.

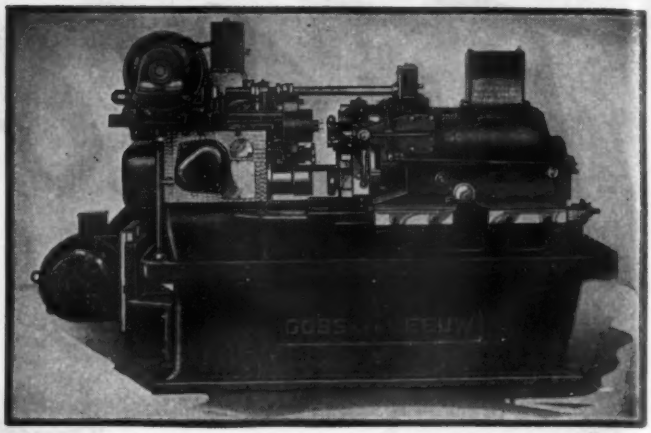


THE YODER COMPANY

Machinery for Metal Manufacture

5500 WALWORTH AVENUE • CLEVELAND 2, OHIO





WORK ROTATING TYPE

- 5 Spindles
- 6 Spindles
- 8 Spindles

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES

TOOL ROTATING TYPE

- 4 Spindles
- 5 Chucking Positions

On these machines, two threading operations can be handled simultaneously, each thread controlled by its own lead screw.

Among the many other modern features offered in both types are: pre-loaded anti-friction spindle bearings, hardened ways, oversize spindles and gears of chrome-nickel steel, heat-treated.

Complete details will be found in descriptive catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

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HORIZONTAL BORING, DRILLING AND MILLING MACHINE NO. 4

• Featuring an extended saddle and table with outer rail support for maintaining exceptional accuracy on long work. Get fully acquainted with the many features of this modern Boring Mill. *Ask for a copy* of our new instructive bulletin which points out the numerous advantages of this new Horizontal Boring, Drilling & Milling Machine.

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Grinds Work from ¾" to 11" in length and from ⅛" to 7" in diameter.

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Gears: 1/4" to 96" Can Now Be Shaved On

RED RING MACHINES

With the announcement of the new 96" shaving machine, it is now practicable to shave gears from 1/4" to 96" P.D. to correct gear cutting errors of index, helical angle, tooth profile, eccentricity, and undesirable tooth roughness. Teeth of gears from 3/8" to 36" P.D. may be shaved to the ELLIPTOID form (crowned) to eliminate "end bearing."

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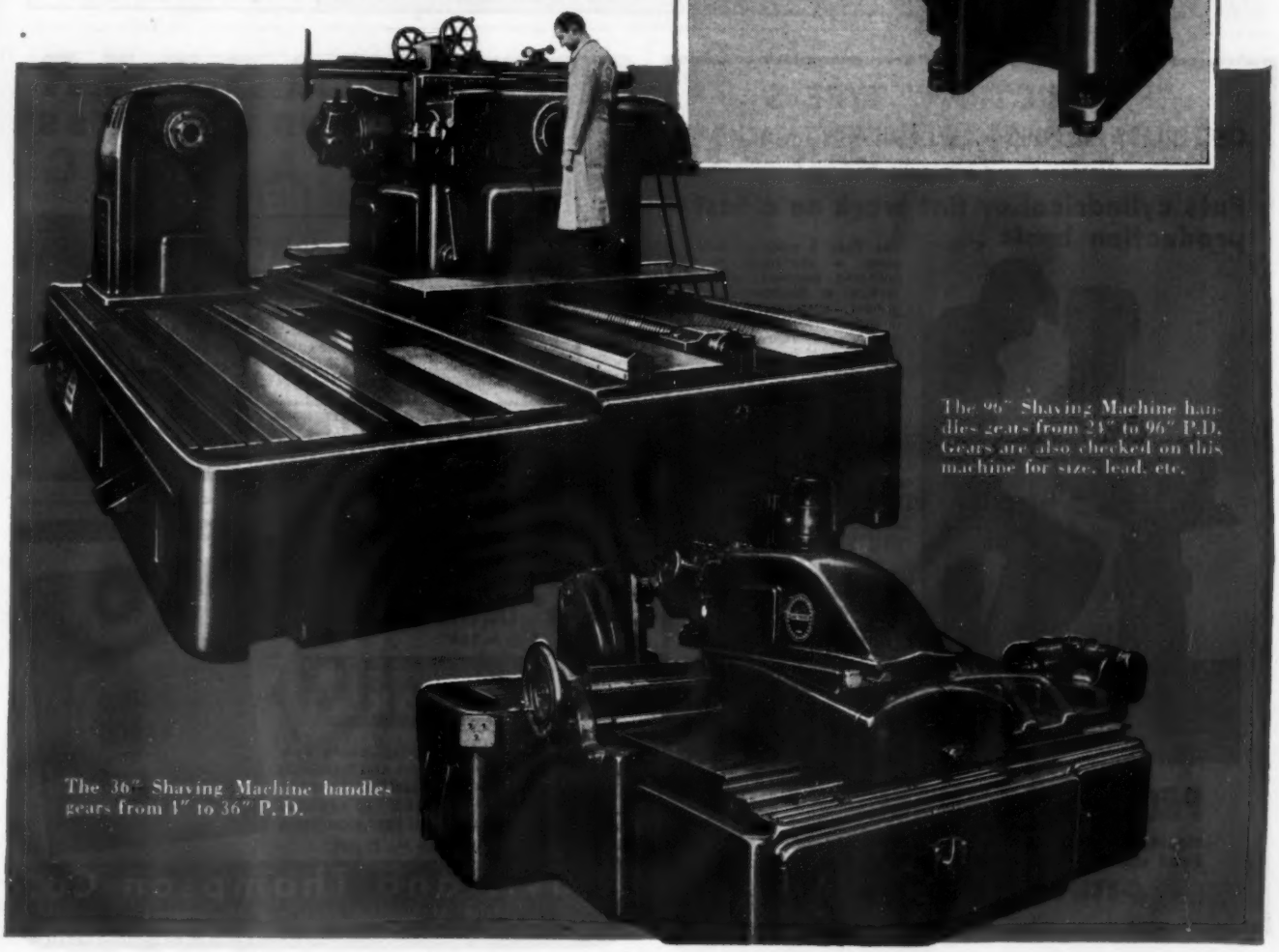
SPECIALISTS ON SPUR AND HELICAL INVOLUTE GEAR PRACTICE
ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

The 8" machine shaves gears from 1" to 8" P. D. The 8" machine with 5" cutter head shaves gears from 3/8" to 8" P.D. The 12" machine handles gears from 1" to 12" P.D. and the 18" machine, gears from 3" to 18" P. D.

The 3" Shaving Machine handles gears from 1/4" to 4" P.D.

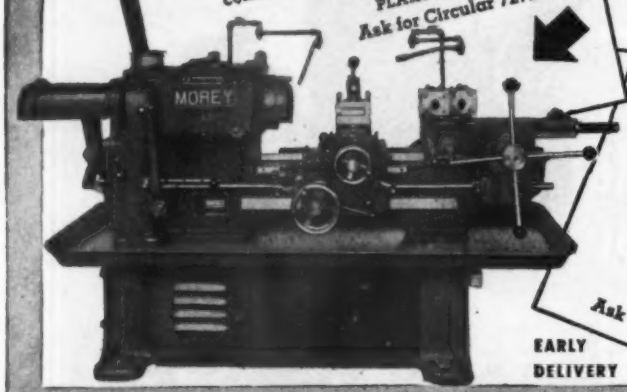


The 96" Shaving Machine handles gears from 24" to 96" P.D. Gears are also checked on this machine for size, lead, etc.

The 36" Shaving Machine handles gears from 4" to 36" P. D.

MOREY TURRET LATHES
for BAR or CHUCKING { UNIVERSAL or PLAIN

#3 UNIVERSAL
For bar stock up to 1½" in diameter
10" turning length
16½" swing over bed
Infinite spindle speeds: 55 to 1800 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
Ask for Circular 727A



#2 PLAIN-GEARED
For bar stock up to 1" in diameter
Turning length 6½"
Swing over cross slide 6"
Swing over bed 14"
Infinite spindle speeds:
Minimum of 60 RPM.
Maximum of 2000 RPM.
Constant horsepower at all speeds.
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#4 UNIVERSAL
For bar stock up to 2" in diameter
12" turning length
19½" swing over bed
Infinite spindle speeds: 35 to 1500 RPM, constant speed motor, 1200 RPM
AVAILABLE ALSO WITH PLAIN CROSS SLIDE
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EARLY DELIVERY

- INFINITE SPINDLE SPEEDS —Electrically Selected—
- DIRECT BELT DRIVE AVAILABLE AT HIGH SPEEDS ELIMINATES GEAR MARKS (patents applied for).
- GEARED SPINDLE SPEEDS INSTANTLY AVAILABLE THROUGH MULTIPLE DISC CLUTCHES.
- SPINDLE MOUNTED ON TIMKEN BEARINGS.
- RIGID—WITH SUFFICIENT POWER TO TURN AT THE HIGHEST SPEEDS AND FEEDS *MODERN* TOOLS WELL WITHSTAND.
- SPINDLE SPEEDS AND POWER FEED CHANGES WITHIN EASY REACH OF OPERATOR.

ARMY E NAVY

THE DESIGN OF THE MOREY No. 2, 3 and 4 TURRET LATHES ARE BASICALLY ALIKE. EACH MACHINE IS ENGINEERED FOR THE SIZE WORK IT IS DESIGNED TO HANDLE.

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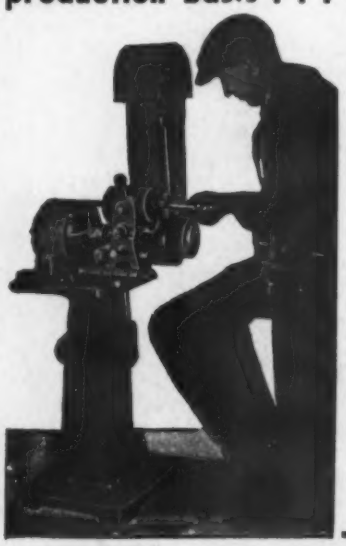
PLANT: 4-57 26TH AVE., ASTORIA 2, NEW YORK

"PRODUCTION" TYPE S
CENTERLESS POLISHING AND FINISHING MACHINE

Puts cylindrical or flat work on a fast production basis . . .



The Type S machine combines a centerless feed polishing machine with a vertical or horizontal belt grinder, surfacer, polisher or buffer. It can be quickly changed from vertical to horizontal or from handling cylindrical work to straight line finishing of flat or irregular work. Anything, such as metals, rubber, fibre, wood, etc., which can be ground or polished can be handled by anyone on this machine. No special skill is required. High speed work is assured.

Features

Patent Centerless Feed for cylindrical work
Feed mechanism quickly removed
Adjustable guage for bevels
Automatic belt take-up
Tracking device for belt
Direct motor drive
Ball bearing equipped

Folder giving details available on request.

PRODUCTION MACHINE CO.
Manufacturers of Drilling Machines, Tool Grinders and Hand and Automatic Polishing and Grinding Machines.
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* Up to 168"

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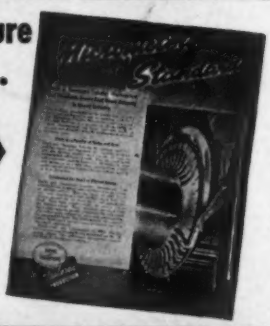

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Date
Check only the items which apply to the model being tested
Lathe Serial No.
HEADSTOCK SPINDLE
Check
Oil gears, gear studs and hole in reverse lever
Reverse lever in three positions
Drive gears for noise and runout
Ball gear and pulley for runout
Back gears and back gear shifter adjustment.
Bearing adjustment for end play
Spindle nose thread - shoulder to gauge
Spindle hole for collet attachment
Gauge spindle taper to gauge
Spindle shoulder
Spindle nut runout
Test bar total runout
Test bar parallel with lathe ways on side
Test bar parallel with lathe ways on top
TAILSTOCK
Accuracy and adjustment
fit
OK
EVERY Logan LATHE GETS
THIS FINAL INSPECTION

The outstanding performance of Logan Lathes in sustained accuracy and speed results from the exacting care that goes into every detail of construction. In the final inspection, a point-by-point check of the entire machine assures a completed assembly ready for production service. Of equal importance, all individual parts and all sub-assemblies are thoroughly tested as they are manufactured to prevent incorporation in the machine of any part not up to standard. The rigorous checking of parts, sub-assemblies, and the final inspection, strictly control the consistent accuracy and quality characteristics of Logan Lathes. Ask your nearby Logan Lathe dealer, or write for latest catalog describing all models of Logan Lathes.

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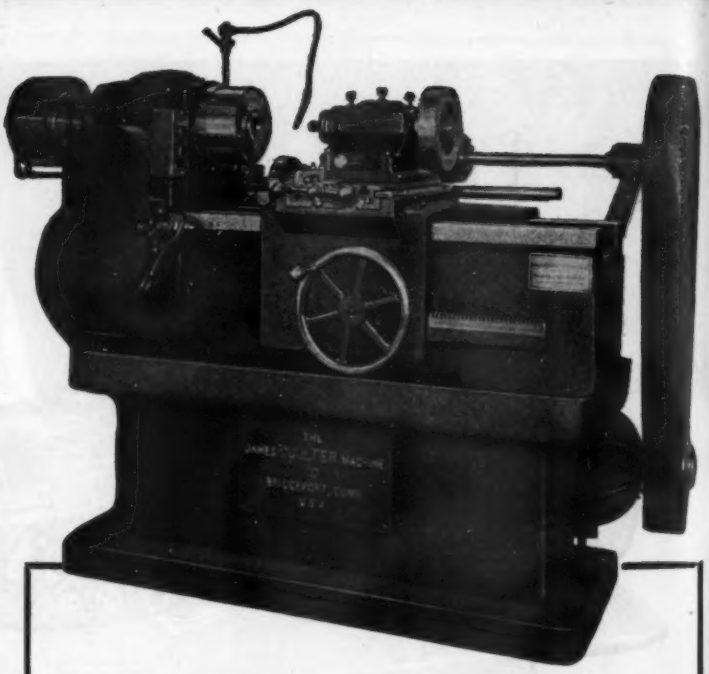
A NAME TO REMEMBER WHEN YOU THINK OF LATHES

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS



The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

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Let the SCLEROSCOPE speed up the production of that s so we can blow the Axis to HELL

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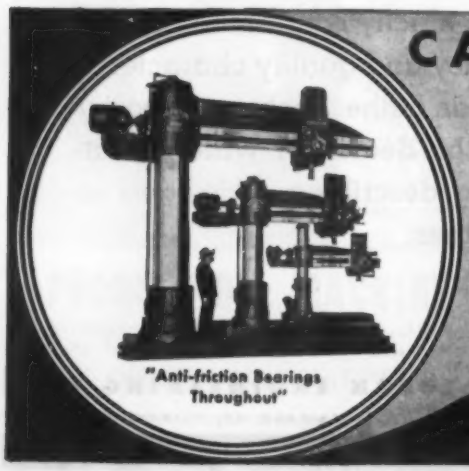
SMITH & MILLS
CRANK SHAPERS
sizes 12" to 32" stroke
THE SMITH & MILLS CO. Cincinnati, Ohio



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FEATURES—1. Low Hung Drive to the Spindle. 2. All Power Driven Parts Running in Oil. 3. Quiet Running at all speeds. 4. Concentrated and Convenient controls. 5. Constructed on Unit Principal.

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MACHINE TOOL COMPANY
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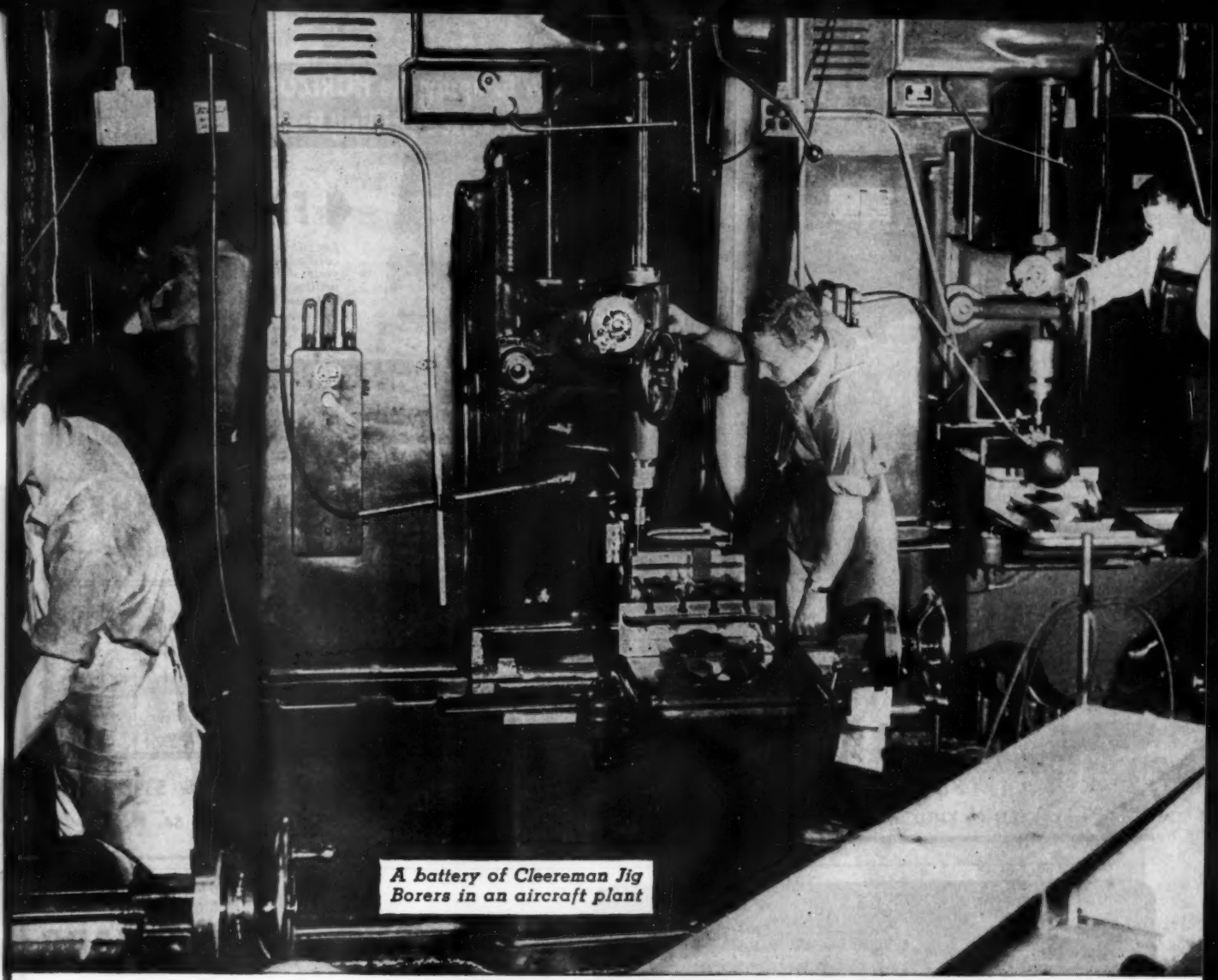
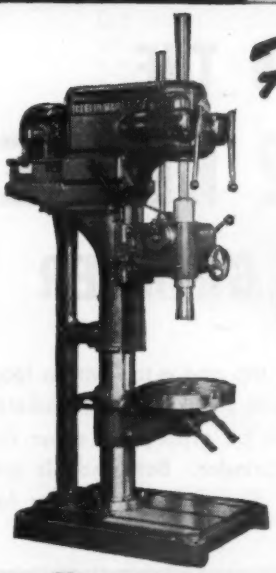


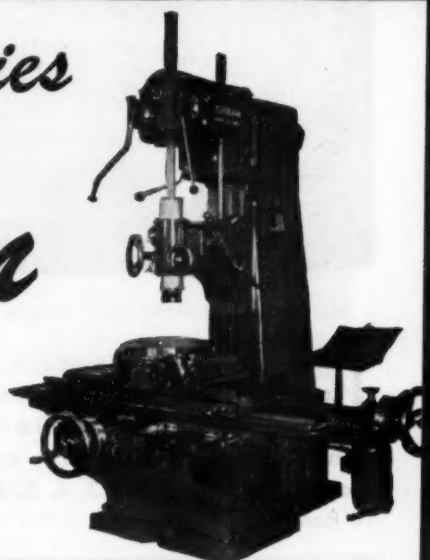
A battery of Cleereman Jig Borers in an aircraft plant

Home Front Batteries by Cleereman



Cleereman Drilling Machine

Many of America's leading manufacturers use batteries of Cleereman Drilling Machines and Cleereman Jig Borers—machines that produce faster and more accurately for war—machines that will help meet postwar competition. Write for catalogs!



Cleereman Jig Borer

BRYANT MACHINERY & ENGINEERING COMPANY

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SHELDON Precision Lathes have been selected by the Army for its Mobile Machine-Shop Units, by the Marine Corps for its trailerized shops and by the Navy as the ideal lathes for several types of repair shops aboard ship and ashore.

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FREE BOOKLET

Learn how the Roto-Matic principle of continuous operation can be applied to your drilling, boring, reaming, facing, milling, etc., requirements and result in increased production. Write today for this booklet describing the many adaptations and advantages of the Roto-Matic. Ask for Bulletin No. A-110.

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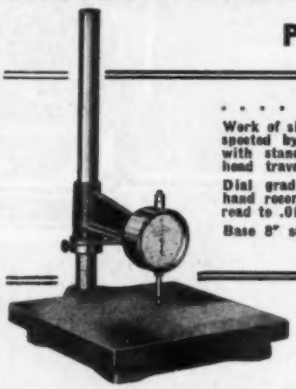
The RANDALL & STICKNEY Platform Gauge



. . . . takes work up to 7 inches

Work of similar size can be quickly and easily inspected by setting gauge head at desired height with standard block or plug. Spindle on gauge head travels ½".

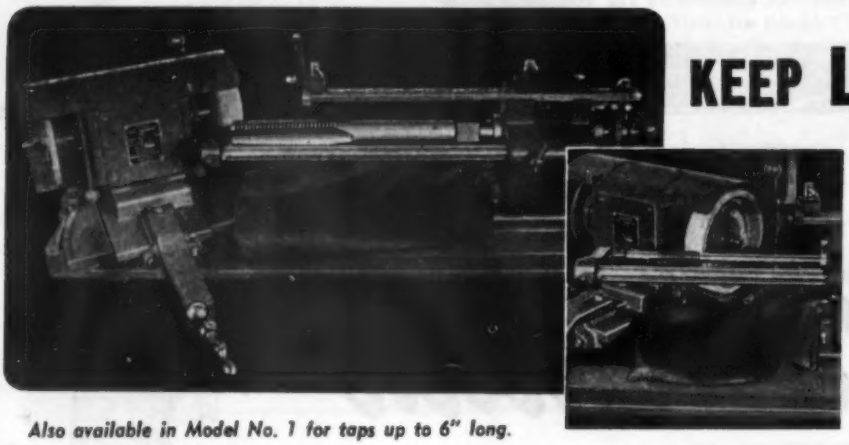
Dial graduated 0 to 50 in thousandths; second-hand records 10ths of inches. Can be furnished to read to .01 mm.

Base 8" square; height 13"; weight 18½ lbs.

Investigate Now!

RANDALL & STICKNEY

Waltham 54, Mass.



KEEP LONG TAPS SHARP ON THE NO. 2 BLAKE TAP GRINDER

Also available in Model No. 1 for taps up to 6" long.

THE No. 2 Blake Tap Grinder is designed especially for long taps, or those with long pilots, that are difficult to sharpen by any other means. The No. 2 is used profitably even with inexperienced help — and sharpens to original accuracy all taps with 2, 3, 4, 5, 6, 8 or 10 flutes, up to 14 inches long.

The illustrations show a long tap and a tap with a long pilot being sharpened. Taps with shanks ½" in diameter and smaller, in any length, can be ground on either the No. 1 or No. 2 Blake Tap Grinder. Both models are fully described in Bulletin No. 5 — mail the coupon for your free copy!

EDWARD BLAKE COMPANY

634 COMMONWEALTH AVE.
NEWTON CENTRE 59, MASS.

BLAKE TAP GRINDERS — FILTAIRE PORTABLE DUST COLLECTORS — AMERICAN TOOL HOLDERS — BLACK DIAMOND PRECISION DRILL GRINDERS — WALTHAM CUTTER SHARPENERS

Please send me Bulletin No. 5.

A.M.

Name..... Title.....

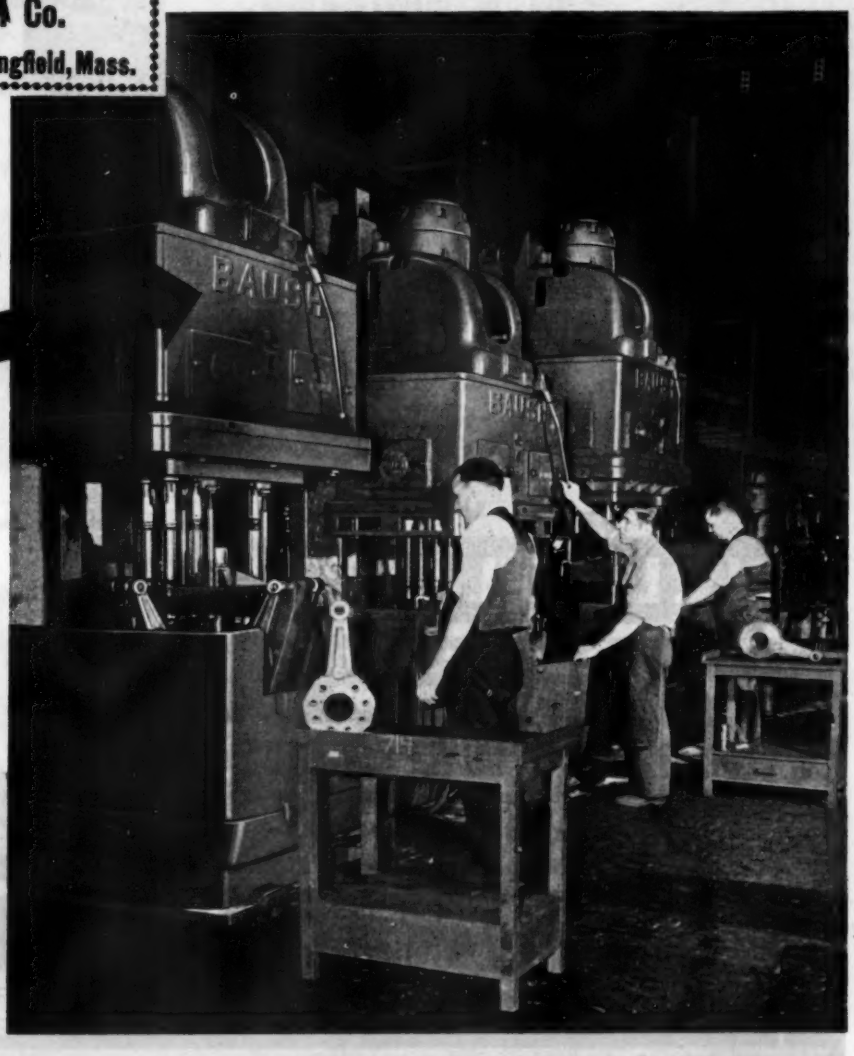
Company.....

Street.....

City..... State.....

The Leader THEN . .

the Leader NOW



In a plant of the Pratt & Whitney Aircraft Corporation, Baush Multiple-Spindle Machines are helping set new records in the production of Aircraft Engines for America's fighting planes.

Primitive by today's standards—yet the Baush unit featured in the 1897 MACHINERY advertisement above (reprint from MACHINERY, September, 1897) represented the farthest advance in multiple-spindle productivity in its day. It is typical of the equipment that served to establish Baush leadership in the high-production field half a century ago.

Today's modern, improved Baush Machines—products of the same spirit of pioneering and constant improvement—are still the unsurpassed leaders in their field. In plants all over the nation they are being applied successfully to the intricate, accurate, speedy manufacture of war equipment . . . as in the Pratt & Whitney plant (large illustration) where a battery of Baush Machines is shown performing important operations on Aircraft Engine Parts. Baush is ready to serve you in your problems of multiple-spindle drilling, boring, tapping and reaming.

Send blueprints for recommendations.

BAUSH MACHINE TOOL CO.

SPRINGFIELD 7, MASS.

With production changeovers, you will appreciate the versatility of ARTER ROTARY SURFACE GRINDERS. At the left are typical examples of the wide variety of products which are being successfully ground by ARTERS.

ARTER engineers stand ready to help you to get the most out of your machines, and to suggest grinding methods by which your products can be kept at top speed in the days of industrial development — in the new era which the dawn of Victory will bring to American industrialists.

Capacities 8" to 40".

ARTER GRINDING MACHINE COMPANY

WORCESTER, MASSACHUSETTS • U. S. A.

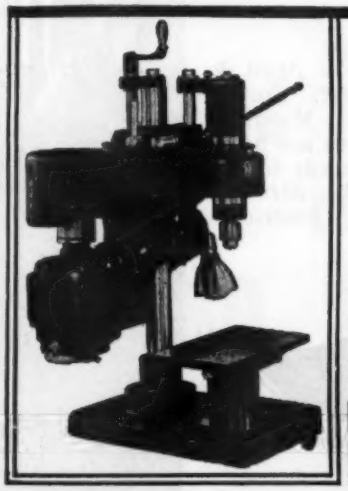
MILLHOLLAND

Automatic DRILLING - BORING MILLING - TAPPING *Units*

½ to 20 HORSEPOWER DRIVE

AUTOMATIC and SEMI-AUTOMATIC PRODUCTION MACHINERY

W. K. MILLHOLLAND MACHINERY CO.
Indianapolis, Ind.



HAMILTON-MUEHLMATT

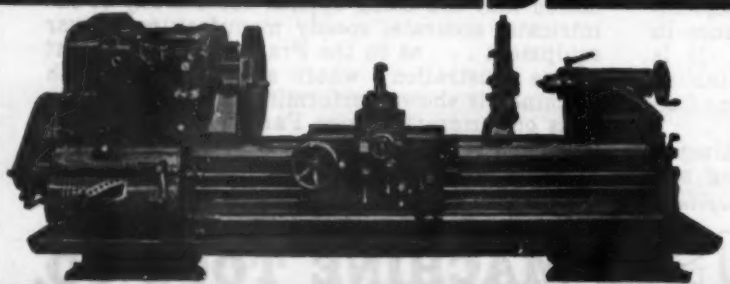
"VARIMATIC"

offers a wide range of super sensitive drilling speeds

The wide range of drilling speeds provided in the "Varimatic" makes it adaptable for the finest of tool room work, instrument, diesel, electrical, airplane and similar precision work. It is built to "instrument precision" and has a capacity for drills from .004" to 5/16" inclusive. Speed Ranges as follows—Low Range—Minimum 840—Maximum 2700—High Range—Minimum 2900—Maximum 9300. Write for details.

The Hamilton Tool Co.
HAMILTON OHIO

SPRINGFIELD GEARED HEAD LATHES



for peacetime or war production!

A lathe purchased now, for round-the-clock war production, must still meet peacetime requirements. Therefore, specify SPRINGFIELD lathes —flexible, efficient, ideal for emergency or normal production. SPRINGFIELD lathes are built in sizes from 14" to 30". Write for descriptive bulletins, prices, deliveries, etc.

The SPRINGFIELD MACHINE TOOL COMPANY • • • SPRINGFIELD, OHIO, U. S. A.

GORTON

SPECIALISTS FOR OVER 50 YEARS IN

Tracer-Controlled MILLING

8 mm. movie camera case profiled in large quantities

TRACER CONTROL Proven FASTER METHOD FOR HIGH PRODUCTION PROFILING

High Accuracy and Finer Finish Maintained . . . Production Doubled

An American camera manufacturer found the Gorton Duplicator the ideal machine for high production profiling of both seat for cover and film tract clearance of camera cases, holding tolerances of ±.003". Gorton high spindle speeds produced the required fine finish.

SIMPLE HEAT-TREATED MASTER determines cutter path. For high production, pneumatic clamping provides easy loading and unloading and simultaneously regulates flow of coolant.

On jobs like this, the Gorton Duplicator permits any reasonably good operator to perform satisfactory work, maintaining high accuracy, comparable to results of highly skilled mechanics on special production equipment.

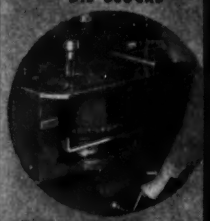
PRODUCTION DATA

Operation—Profiling to fine finish.
Material—Aluminum alloy.
Speed—4,000 r.p.m.
Feed—Manual.
Production—30 per hour.
Previous Method—15 per hour.

GORTON ENGINEERING SERVICE, FREE

Investigate the possibilities of the Gorton Duplicator as the practical, economical solution to your high production profiling problems. Gorton engineers who have specialized for 50 years in the development of tracer-controlled milling will give you their recommendations without obligation. Submit part, prints or specifications to your Gorton dealer, or Factory at Racine, Wis.

The *Right* Size The *Right* Type of Machine for Every Job . . .
From .2 oz. to 2 ton DIE BLOCKS



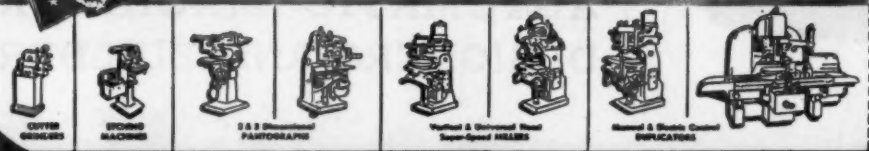
Tracer-Controlled MILLING

Tracer-Controlled DUPLICATING

Tracer-Controlled ENGRAVING

Tracer-Controlled ETCHING

GORTON Precision MACHINES



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George Gorton Machine Co.,
1509 Racine St., Racine, Wis.
Send me these free books
☐ Condensed Catalog
☐ Die and Mold Duplicators

Name..... *Title*.....
Company.....
Address.....
City..... *State*.....

Something NEW in Shapers

THE 20" QUEEN CITY
Super Twenty Shaper

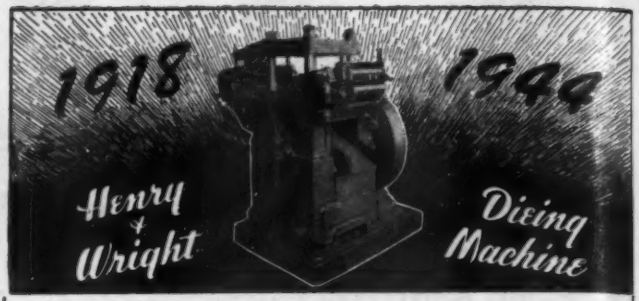
The new Super Twenty Shaper makes available important conveniences that simplify operation and speed production to an extent never before possible.

A few of the many features are: V-type ram, wide bearing bottom and sides; dry, multiple-disc type clutch; a wide feed range, easily changed to produce fine tool room work or the heaviest roughing; an electrical limit switch in the rail for complete motor control; heavy-duty Timken bearings throughout.

This heavy rugged machine is the very latest in shaper design and efficiency — built to provide greater accuracy and output not previously obtainable. For complete details write for literature.

AGENTS IN PRINCIPAL CITIES

QUEEN CITY MACHINE TOOL CO.
217 E. SECOND ST.
CINCINNATI 2, OHIO



He turned the press UPSIDE DOWN!

When, after several years of development work, D. M. Wright turned the conventional press upside down in 1918, he also turned existing stamping standards "upside down."

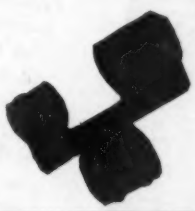
The first Dieing Machine, built without automatic feed, could run immeasurably faster than hand feeding permitted. Hence, an automatic feed was developed. One of the great obstacles overcome was to build a feed flexible enough to handle the dies which a customer already was using, in addition to the ideal type of progressive die.

Successfully meeting this requirement, Henry & Wright devised and produced the first *universal* roll feed, eliminating the practice common on other presses, of having feeds suited only to particular jobs, with necessity for time and expense of change-over to suit each job.

Advantages of the H & W Universal Roll Feed are: (1) adjustable height of metal line to accommodate dies of various thicknesses, (2) feed arranged to swing open over 90° to permit quick and convenient installation and removal of long progressive dies, (3) inbound and outbound feeds can operate at different die levels as often required to satisfactorily handle production of drawn parts in progressive dies, (4) adjustable feed pitch from conveniently located adjusting screw, (5) cam control of lifting of upper roll to permit pilots to register the material and allow rolls to grip material before punches are withdrawn from the stock, (6) feed arranged so that short lengths of material can be fed continuously without stopping machine between strips, (7) hardened and ground rolls.

Made in capacities of 10 tons to 300 tons, the Dieing Machine produces intricate stampings COMPLETE PER STROKE within limits of .0002" as required. At speeds up to 600 s.p.m. REQUEST CATALOG 44.

Machine gun belt link produced complete one per stroke to extreme precision limits at exceptionally high speed.



THE HENRY & WRIGHT MFG. CO.
463 Windsor St. Hartford 1, Conn.

Henry & Wright

AUTOMATIC MACHINERY DESIGNERS AND BUILDERS

COMPARE!

See for yourself why so many operators choose DIEHL!

By comparison, the Diehl No. 2 Turret Lathe is first choice in many manufacturing plants today. Designed to meet the demand for an economical lathe with the capacity for high production at exacting specifications, the Diehl No. 2 is unsurpassed for sustained, high speed, precision performance. On the production line, the Diehl works alongside other No. 2 lathes of standard make, using same tooling, including collets.

You can't beat Diehl for long years of economical service, vibration-free operation with ample power to meet extreme production requirements. Compare and see for yourself. Write today for illustrated brochure and complete specifications.

Automatic chuck capacity (round)	*1"*
Swing-over cross slide	*6"*
Swing-over bed	*14"*
Six speeds	*forward and reverse*

The G. M. **DIEHL** *Machine Works, Inc.*

WABASH, INDIANA

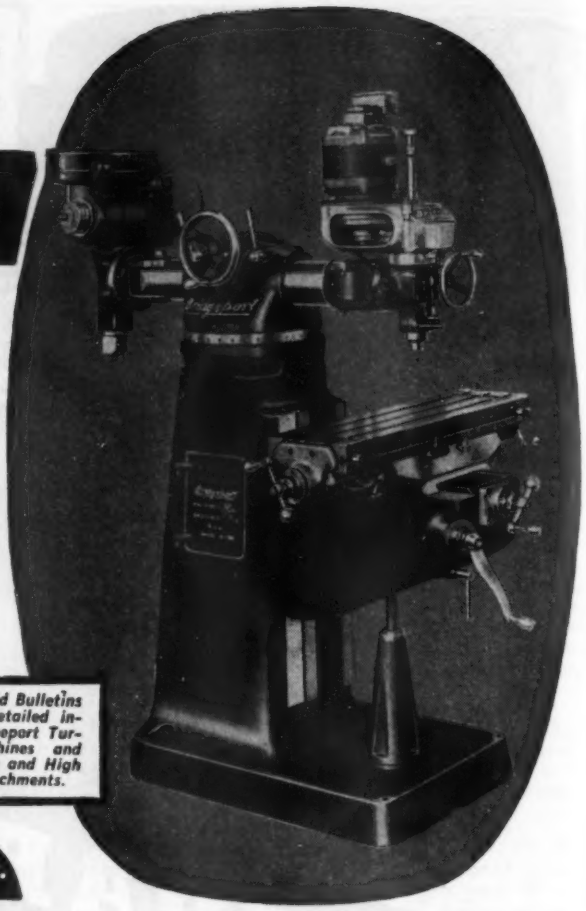
WHERE PRECISION CRAFTSMANSHIP IS HONORED.

SHAPING *in addition to* MILLING, DRILLING *and* BORING . . . *now available on*

Bridgeport

TURRET MILLING MACHINES

The new Bridgeport Shaping Attachment adds an extra feature which makes these machines capable of almost unlimited utility. Design is such that this new attachment can be mounted not only on existing Bridgeport Turret Milling Machines (shown here on back end of overarm) but also on other types of milling machines and special production equipment. Shaping operations can be performed at all angles making this attachment fast, and practical on die and mold work of all kinds as well as for intricate slotting on production jobs. The Bridgeport Shaping Attachment is now in production and is available promptly.



Investigate This Versatile Machine

The Bridgeport Turret Milling Machine with High Speed Milling Attachment handles milling, drilling and boring at all angles with maximum ease and convenience. It can be depended on for accuracy and speed on a wide range of work. It is sturdy and powerful—a precision machine for production demands.
Features of the machine include: 15" diameter turret with 5" overarm, rugged construction, table, knee and saddle in convenient front-of-machine position, anti-friction bearings throughout, keyed overarm with worm wheel control for angular settings, large diameter graduated dials.

Bridgeport High Speed Milling Attachments are available as separate units (¼ HP and ½ HP) for use on other types of milling machines and production equipment. They are extensively used in all branches of the metal working industry and making a valuable contribution to war production.

Write for Illustrated Bulletins giving complete detailed information on Bridgeport Turret Milling Machines and Bridgeport Shaping and High Speed Milling Attachments.

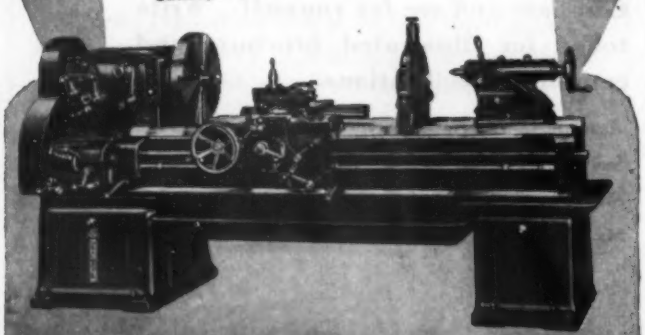
THE BRIDGEPORT MACHINES, INC., *Bridgeport, Conn.*

Metalmaster

12", 14" & 16" LATHES

Offer: Infinite range of threads and feeds. Easy gear adjustment. Independent motor mounting. Short, direct drive. One control for all threads. Ample power for heaviest cuts. Automatic stop for feeds.

Catalogs sent on request. Write for yours!



The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO

GRAND RAPIDS

No. 15
Motor Driven
Surface Grinder
HAND FEED

•

FOR SMALL DELICATE JOBS

6 x 18" Capacity
1½ H.P. Motor
10 x 1" Wheel

Reasonably Prompt Delivery

Many manufacturers on war work are using large batteries of these grinders.

CATALOG ON REQUEST

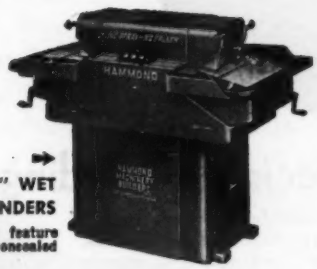
GALLMEYER & LIVINGSTON CO.

330 Straight Ave. S. W.
GRAND RAPIDS 4 MICHIGAN

Hammond OF KALAMAZOO
GRINDING and POLISHING EQUIPMENT

CHIP BREAKER GRINDERS

Light and Heavy Duty



10" WET 14" WET

CARBIDE TOOL GRINDERS

Hammond 10" and 14" Wet Grinders feature patented No Spray — No Splash concealed wheel guards.

CARBIDE TOOL GRINDERS

Hammond offers you complete carbide tool room equipment . . . Chipbreaker Grinders, 6", 7", 10" and 14" Wet-n-Dri, and 20" Wet Grinders for rough and finish grinding of all size carbide tools and hi-speed tool Hammond products incorporate many years of practical "know-how" experience of carbide tool makers, tool engineers and shop men.

No. 3 BACKSTAND-IDLERS No. 4

Hammond units above show typical applications of backstand-idlers Nos. 3 and 4, as indicated, with guards for converting polishing lathes into hi-production abrasive belt grinders or finishing machines.

10" GRINDER "WET-n DRI"

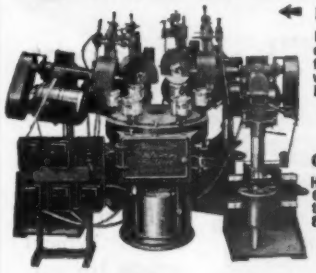
Hammond 10" giant for wide range of larger pieces.

ABRASIVE BELT GRINDERS

Hammond 4", 6" and 10" Abrasive Belt Grinders, and Backstand-Idlers for converting polishing lathes into high production grinding and finishing units, are built to the highest machine tool standards. Any material that can be ground may be surfaced, deburred, chamfered, beveled or finished by the abrasive belt method — faster, more economically and better!

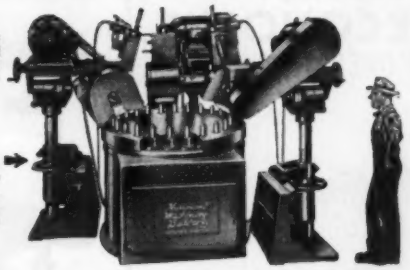
INDEXING TABLE

Hammond 8BL-6, 34" indexing table; 6 stations; four 5 HP, 50-81 lifting wheel heads with Auto-Dopers".



CONTINUOUS TABLE

Hammond 48-CR-24, 48" Continuous table; 24 stations; three 7½ HP, 50-84 wheel heads with Auto-Dopers".

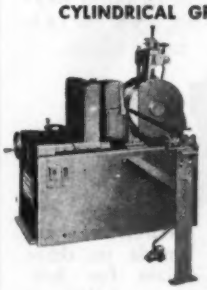


AUTOMATIC FINISHING

Hammond J-Rotary Indexing and Continuous Table Automatics are hi-production, large volume finishing machines for deburring, brushing, polishing or buffing operations. They are built in various combinations of relatively standard units combining rotary or continuous tables with wheel heads and stands to suit the particular operations required. Consult our engineers.

CYLINDRICAL GRINDING · POLISHING AND BUFFING

¼" to 9" Outside Diameters



Hammond standard unit for use with wheels or Backstand-Idlers and abrasive belts.

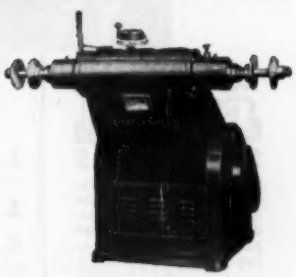
OTHER HAMMOND HIGH PRODUCTION MACHINES

"NO DUST" and OTHER GENERAL PURPOSE GRINDERS

For wheels 10" up to 24" diameters.

SINGLE and MULTI SPEED GRINDERS

1, 2, 3, 4 speeds, 5 to 15 HP for grinding wheels 18" up to 30" in diameter.



POLISHING LATHES

Single and variable speeds, 2 up to 50 HP capacity.

WRITE FOR LITERATURE

Hammond Machinery Builders

1618 DOUGLAS AVENUE, KALAMAZOO, 54, MICH.

EASTERN BRANCH 71 WEST 23rd STREET, NEW YORK, 10, N. Y.

Vitrified Wheels

VITRIFIED

. . . for

intricate precision grinding or coarse heavy work

Inasmuch as Vitrified manufactures a complete line of Grinding Wheels in numerous grades, grain combinations and bondings, it is merely a matter of selecting the right wheel for the work to be handled.

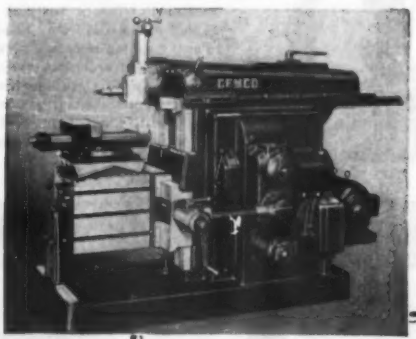
Because of this wide selection, a Vitrified Wheel can be depended on for economy, speed and long life in the specific service for which it is intended.

Whether your work involves roughing, finishing, surfacing, edging, or cleaning, hand, automatic or swing grinding, there is a Vitrified Wheel which will give you maximum service at minimum cost.

Why not call in a Vitrified representative to show you how you can make worthwhile saving in your grinding operations?

VITRIFIED WHEEL CO., WESTFIELD, MASS.

For **TODAY'S REQUIREMENTS**
. . . S-P-E-E-D and ACCURACY
For **POST WAR ECONOMY**
PRECISION PRODUCTS at LOW OPERATING COST!



Your answer is with
GEMCO
SHAPERS

Replace those old worn-out machines **now** with a **"Gemco"** for producing better **Postwar** products at a challenging rate.

★

Write for Bulletin GC-12A giving complete specifications on Plain, Production, and Universal Types.

Prompt Deliveries

GEMCO *Features*
FOR HIGH ACCURACY AND POST-WAR ECONOMY

1. **Exclusive "Lubriguard"**—Assures longer precision life for a profitable investment.
2. **Grouped Controls**—Save time and effort for increased production.
3. **Twin Type Bull Gears**—Helical type—for powerful, quiet operation and minimum wear at all speeds.
4. **Massive Construction**—For maximum rigidity and stamina on heavy cuts.
5. **Large, Easy-To-Read Dials**—For quick, accurate adjustments during cutting operations—Save man-hours.

GENERAL ENGINEERING & MFG. CO. ST. LOUIS 4, MISSOURI

KEYSEATING
The Modern Way

Illustration shows typical set-up for cutting taper keyways with table tilted.

Machines are made in three sizes for keyways 1/16" to 1¼" in width.

Great simplicity and ease of operation of Davis Keyseaters assure the user of accurate, time saving work.

Let our engineer study your keyseating problems.

DAVIS KEYSEATER COMPANY
403 EXCHANGE ST. ROCHESTER, N. Y.

Save Costly Tie-Ups of Large Production Units with this

LOW-COST, VERSATILE SAW

SPECIFICATIONS
WELLS No. 8

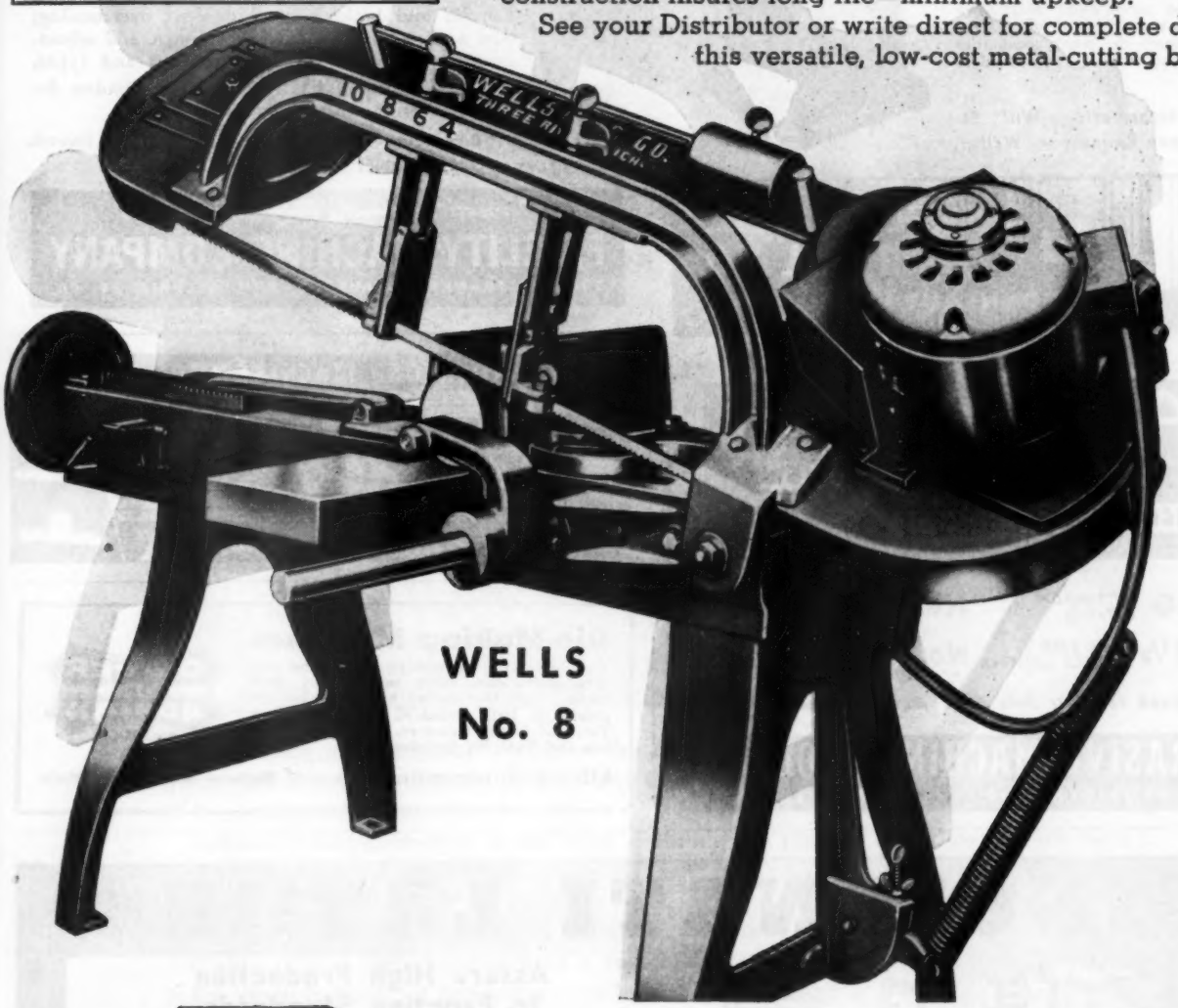
CAPACITY: Rectangular	8" x 16"
(Special Guides)	5" x 24"
ROUNDS:	8" diameter
MOTOR:	½ H. P. current optional
SPEEDS: Selective 60, 90, 130 ft. per min.	
WEIGHT:	Approximately 750 lbs.

You can avoid costly tie-ups of large, special production units in your plant by using a Wells No. 8 Band Saw for odd metal-cutting jobs. It can be used on production . . . in stores or tool rooms . . . or on maintenance work.

The Wells No. 8 with 3-speed selection insures efficient operation. Gravity feed and automatic shut-off allows one man to operate 2 or more Wells Band Saws.

Low first cost, installation and power cost. Simple, rugged construction insures long life—minimum upkeep.

See your Distributor or write direct for complete details on this versatile, low-cost metal-cutting band saw.



Wells SAWS

Wells

Products by Wells are Practical

METAL CUTTING BAND SAWS

WELLS MANUFACTURING CORPORATION
505 ROOSEVELT ROAD, THREE RIVERS, MICH.

BURKE MILLING MACHINES

. . . Put Your Small Work on a Production Basis!

Those small, difficult jobs can be handled on a *production basis* with BURKE Motor Driven Milling Machines Nos. 1, 2, 3, & 4. Primarily, this is because BURKES have been *specially designed and built* to do smaller milling jobs efficiently and economically.

Then, too, a number of attachments are available . . . attachments that increase the units usability, and add to your productivity. These include a vertical milling attachment, index centers, and vises—3 types, including swivel base. Now, when production must be stepped up, is the time to investigate the profit possibilities of BURKE Milling Machines, as applied to your work.

Complete Information Will Be Sent You Upon Request — Write!

BURKE MACHINE TOOL CO.
CONNEAUT · · · OHIO

FIDELITY

Double-End Screw Traverse Spooling Machine . . .

For multiple-end winding of fine wires—sizes .008 to .030 up to twelve ends on each spool. Delivers a smooth, uniform lay at speeds from 40 to 800 feet per minute—depending on size and kind of wire.

Tension and brake control prevent overrunning; slow acceleration avoids wire breakage, and adjustments provide for various wire sizes and types.

New catalog of FIDELITY Wire Spoolers describes other units. Write for it.

Buy Bonds to bring the boys down the Home Stretch

33 YEARS' EXPERIENCE

Intricate, Automatic Precision Machines
FIDELITY MACHINE COMPANY
3908-18 FRANKFORD AVENUE, PHILADELPHIA 24, PA.

ABRASIVE

ACCURACY BOOSTS PRODUCTION

No. 1G	INTERNAL GRINDER	**No. 34**	VERTICAL SPINDLE SURFACE GRINDER
No. 1½	HAND FEED SURFACE GRINDER	**No. 3B**	AUTOMATIC FEED SURFACE GRINDER

Look for Our Full Page Advertisements

ABRASIVE MACHINE TOOL CO.
EAST PROVIDENCE 14, RHODE ISLAND

ROCKFORD MACHINE TOOL CO.

Hy-Draulic

Shapers . . Planers . . Slotters . . Shaper-Planers
— ROCKFORD, ILLINOIS, U. S. A.

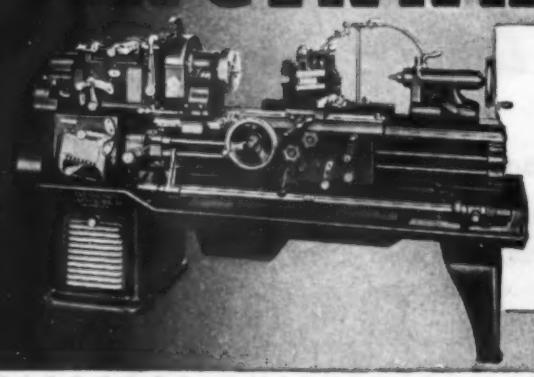
Die-Making Machines

They save 50% on sawing, filing and lapping operations, easily maintaining .002" limits. Ask for special bulletin—also circulars on Drill Grinders, Point Thinners, Tool and Cutter Grinders, Face Mill Grinders and Tool Bit Grinders.

OLIVER OF ADRIAN PRODUCTS

Oliver Instrument Co., 1414 Maumee St., Adrian, Mich.

CINCINNATI LATHES



Assure High Production to Exacting Standards

Ruggedness, accuracy, versatility and speed are combined in Cincinnati Lathes in exactly the right proportion to meet the rigid demands of war production. If you will outline the aircraft, munitions or other similar jobs which require improvement in handling, our engineers will gladly offer suggestions for tooling which will assure the utmost in accuracy and output. Send for catalog giving details of Cincinnati Lathes—in sizes from 14" to 30".

THE CINCINNATI LATHE & TOOL CO.
Rogers Road, Oakley SPECIALISTS SINCE 1906 Cincinnati, Ohio

A plain plug or ring gage, worthy of the name, must have a hard, durable surface, mirror finish and a uniformly smooth face that can withstand the microscopic scrutiny of the surface analyzer.

Achieving this perfection is not easy. Grinding the plug or ring down to the right amount of lap stock requires that intangible quality known in shop parlance as "feel". Lapping the minute grind ridges down to an even, durable surface and, at the same time, holding the dimension within tolerance, is another example of "feel".

Highly skilled craftsmanship plus a constantly controlled precision inspection—that is the Vinco formula for producing a perfect cylindrical gage.

Don't let the simplicity of cylindrical design swerve better judgment. A perfect cylindrical gage is a sound investment. To insure that investment, buy Vinco.

VINCO CORPORATION, 8851 SCHAEFER H'W'Y, DETROIT 27, MICH. SALES OFFICES: NEW YORK, CHICAGO, CLEVELAND

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

WHICH CUTTING-OFF BLADE SHOULD YOU USE ?

The shaded areas in these illustrations of four types of cutting-off blades in general use show the relative amount of grinding that must be done to obtain the required clearances BEFORE any of the blades can start cutting-off operations.

EMPIRE TOOL COMPANY'S LUERS PATENTED CUTTING-OFF BLADE IS READY FOR USE the MINUTE YOU RECEIVE IT

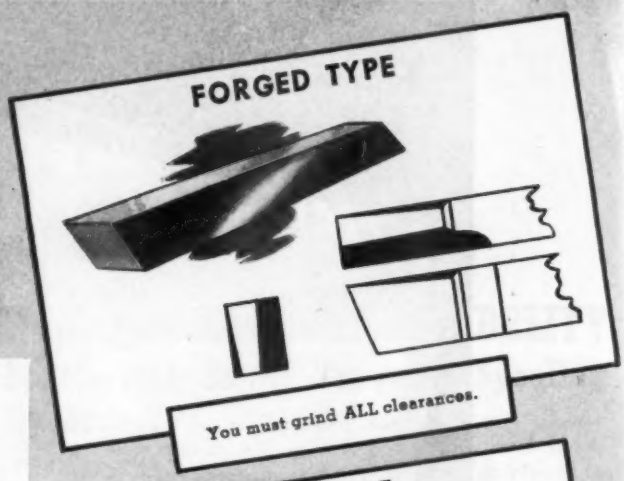
By not requiring any grinding to prepare it for use, the Luers Type Cutting-off Blade presents an advantage of time-saving even before it starts working—and then it continues to save time as long as it is used.

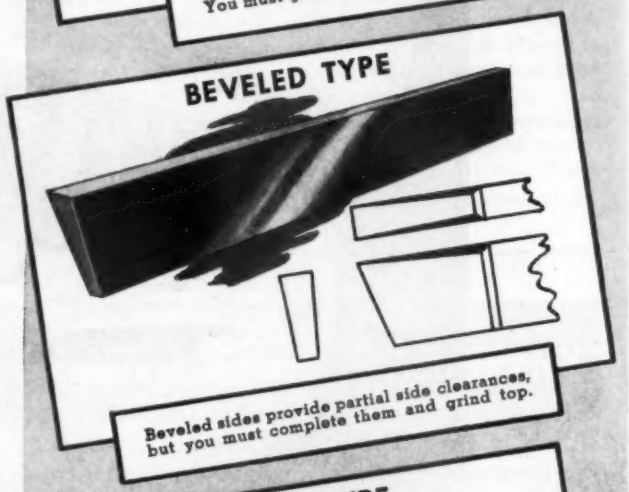
Re-sharpening will be required only on the front face. Side and back clearances remain constant for the life of the blade.

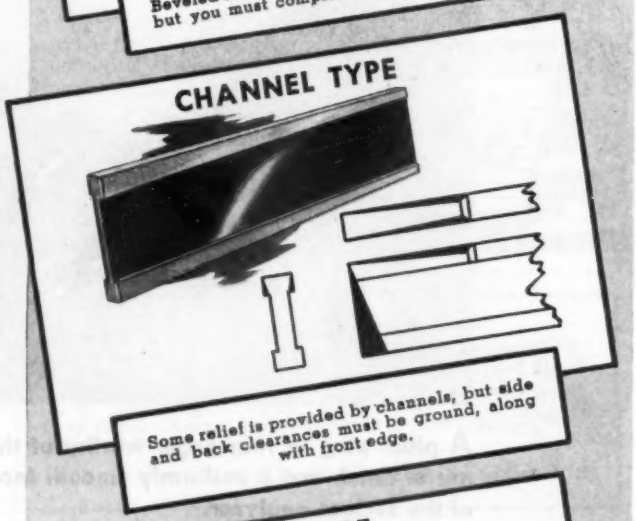
Luers Type Blades are used on hand and automatic screw machines. Our engineers (located in principal cities) will gladly call at your request to assist you in simplifying your cutting-off operations—save time and increase production.

And now all these exclusive features are also available in Cobalt Blades

SEND FOR CATALOG







LUERS TYPE
No grinding necessary. Side and back clearances are all provided—and in addition, a hollow-ground top which causes chip to collapse thereby reducing friction.

EMPIRE TOOL COMPANY MANUFACTURES LUERS PATENTED CUTTING-OFF BLADES AND HOLDERS UNDER LICENSE ISSUED BY JOHN MILTON LUERS PATENTS, INC.

EMPIRE Tool Co.

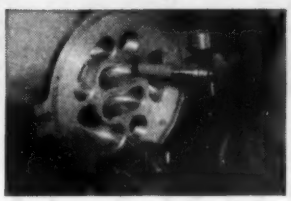
8778 Grinnell Ave., Detroit 13, Mich.

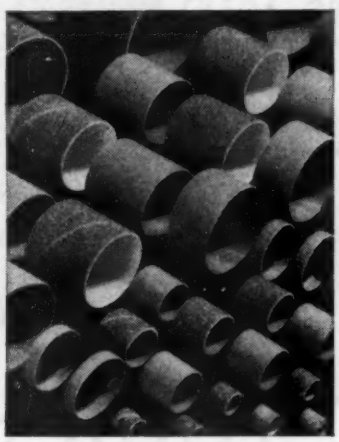
BUY WAR BONDS

WE CALL THEM "WEAPONS FOR PRODUCTION"

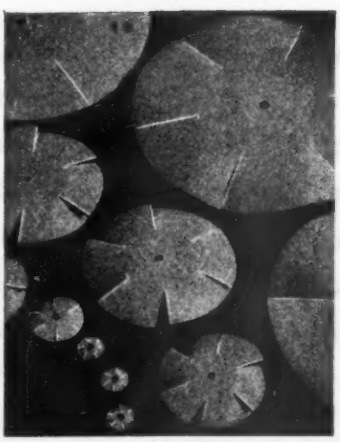
THESE coated abrasive products by Carborundum so speed up and improve the finishing of a thousand and one metal parts that they have contributed mightily to the war effort. There are plenty of jobs on which they can be used in your plant.

"ALOXITE" CLOTH CARTRIDGE ROLLS—for cleaning, polishing out-of-the-way surfaces. Made in straight or tapered forms 3/8 to 1 inch diameter, 1 to 2½ inches long.

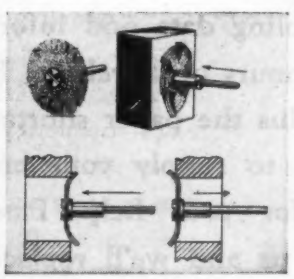




"NOLAP" ABRASIVE BANDS—spirally wound, no overlapping splice. For a multitude of polishing jobs on small and intricate parts. Diameters ¼ to 3 inches, widths ½ to 3 inches—wide range of grits.



MULTI-SLOTTED DISCS—for removing burrs, breaking down edges of holes—fast cutting—flexible—durable.



"ALOXITE" CLOTH—no end to the number of metal finishing jobs to be done with this abrasive cloth—in 9 x 11 inch sheets—in "Economy" Rolls.

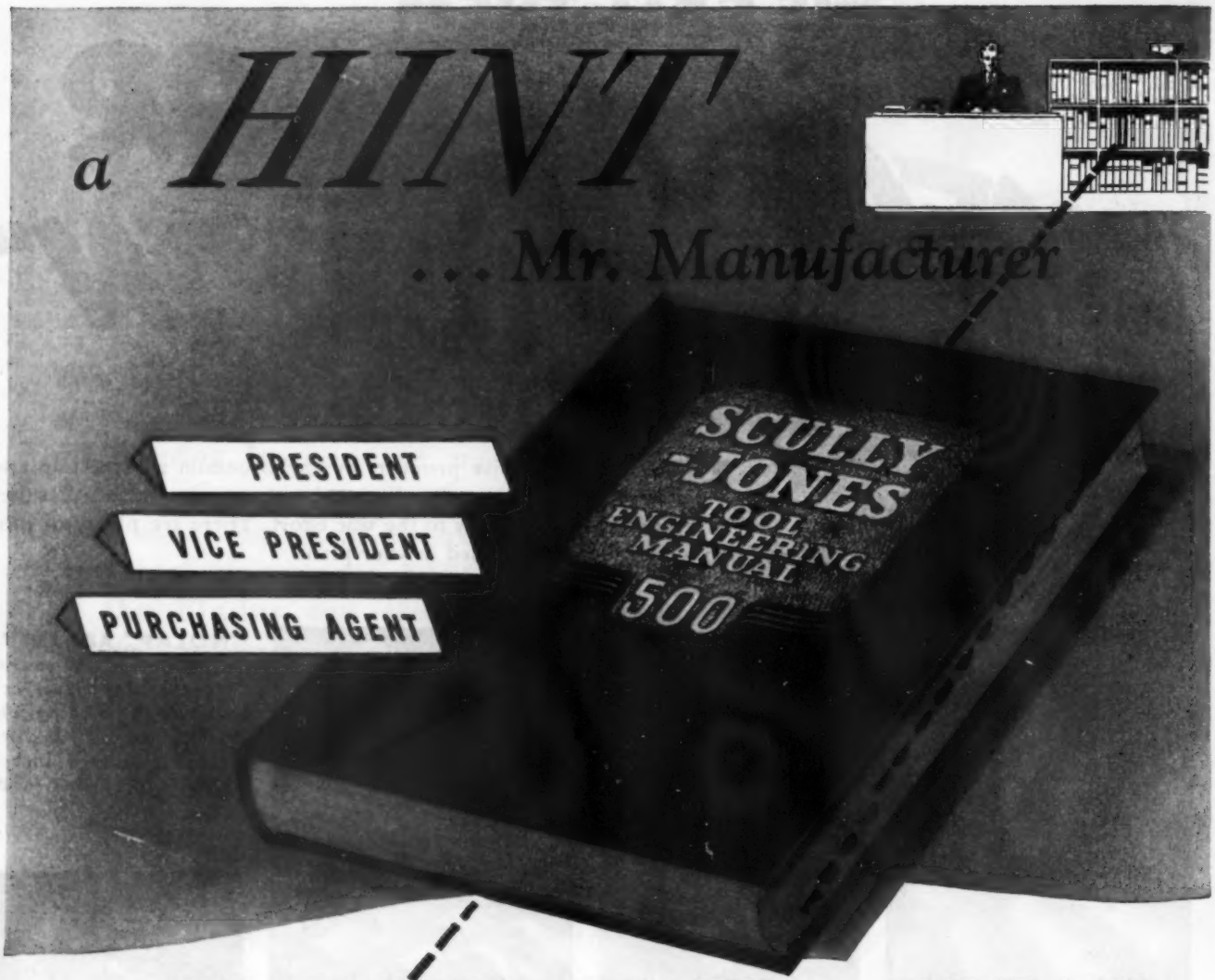
Coated Abrasives by Carborundum of course, include all types of metal finishing discs and belts. Send for illustrated booklet.
The Carborundum Company, Niagara Falls, N. Y.

Sales Offices and Warehouses in New York, Chicago, Philadelphia, Detroit, Cleveland, Boston, Buffalo, Pittsburgh, St. Louis, Cincinnati, Grand Rapids

Coated Abrasives by CARBORUNDUM TRADE MARK

(Carborundum, Aloxite and Economy are registered trade marks of and indicate manufacture by The Carborundum Company)

a HINT ... Mr. Manufacturer



GIVE YOUR STAFF A BREAK

CHIEF ENGINEER

DESIGNER

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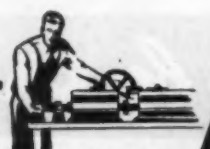
SHOP SUPERINTENDENT


TOOL ROOM

Your different department heads need the help you can give them by passing along *your* copy of the Scully-Jones Tool Engineering Manual 500. The tooling data and information in this book will save them long hours of searching. Requests from the men in the shop plus the paper shortage has made it impossible for us to supply your entire staff with books, so we ask for your help. Pass your copy on to the shop, notify us and we'll replace it when victory is won.

Scully-Jones AND COMPANY
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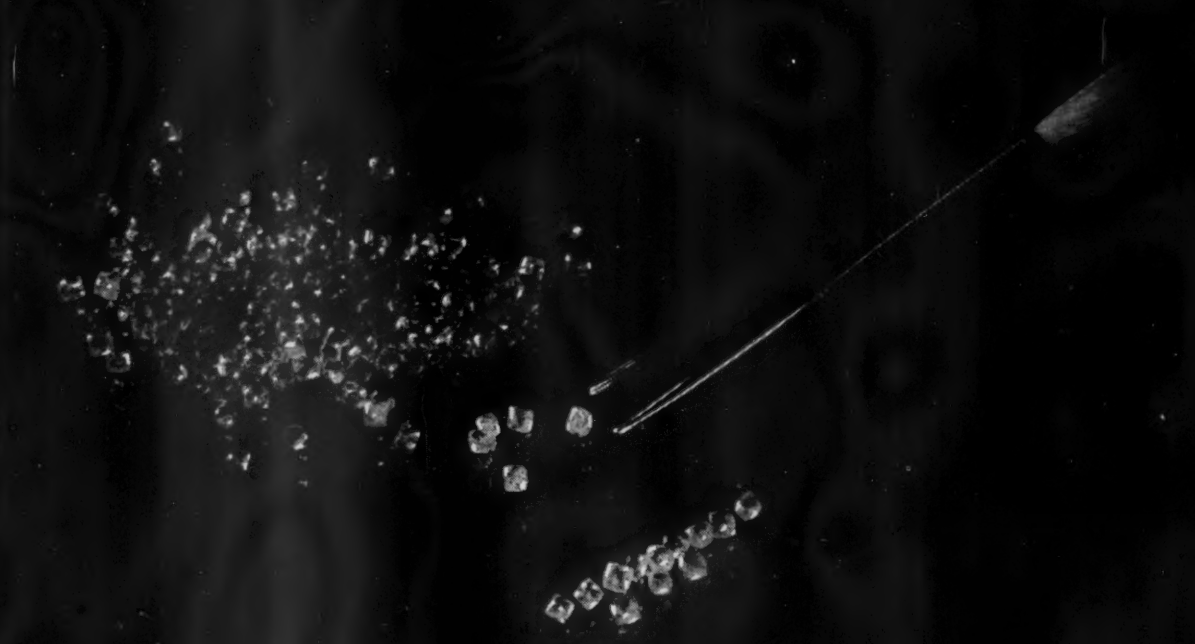
LIKE TO PICK YOUR OWN *Diamonds?*



Get a selection from Wheel Trueing's big stock . . . choose those you want and get exactly the kind of diamonds you prefer.

While the introduction of highly specialized engineered diamond tools (which Wheel Trueing pioneered) has done much to change buying habits, there are still plenty of diamond-wise production men, purchasing agents and heads of grinding departments who thoroughly understand the characteristics of diamonds, who are competent buyers and who still prefer to select unmounted stones.

Many of these experienced buyers have bought their diamonds from Wheel Trueing for a third of a century or more and in many instances leave the selecting of diamonds for their needs entirely in the hands of Wheel Trueing.

With Wheel Trueing sales offices located strategically throughout the country, it is an easy matter for us to get diamond assortments to you for your inspection and selection and you will find in every Wheel Trueing diamond assortment, the high quality that results in worth-while production economies.

Your inquiry will receive prompt attention.

Send for a copy of our booklet "Tips on Using Diamond Tools." You'll want copies for all your operators.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada

How these Big 8 Tool Steels reduce tool-room problems

Although Bethlehem manufactures a number of different tool steels, the group known as the Big 8 is suitable for a great majority of applications . . . in fact, these eight grades can be used on 97 per cent of your tool-steel work. At the right are their names and the type of work each one does.

By standardizing on Bethlehem's Big 8, a shop can reduce the *number* of tool steels carried in stock. This, in turn, simplifies heat-treating problems. Moreover, the final results—in terms of finished products—will equal or even surpass those obtained by working with a larger number of grades.

There is another advantage, too. Using these few specialized steels, both the tool room and the heat-treating department can readily familiarize themselves with the properties of each individual type.

You can put these tool steels to work with the assurance that every one of them is a tried-and-true campaigner, *for all eight are back on prewar analyses.* A Bethlehem engineer will be glad to explain their various qualifications.

CARBON TOOL STEEL (water-hardening). For an almost endless list of dies, cutting tools, punches, etc.

TOOL ROOM (oil-hardening). For dies, punches, broaches, hobs, drill bushings, forming tools, gauges, and similar tools.

OMEGA (oil-hardening). One of the best of all shock-resisting steels. For cold-battering tools and machine parts subject to shock.

No. 67 CHISEL (oil-hardening). Primarily for battering and shock purposes—both hot and cold work. Also master hobs.

AIR-HARDENING. Another famous die steel—air-quenched, as the name implies. Develops a hardness comparable to that of liquid-quenched die steels.

LEHIGH DIE and TOOL, H Temper (air- or oil-hardening). Recommended where minimum deformation in heat treating is required. A steel for maximum production.

No. 57 HOT WORK (oil- or air-hardening). Especially suitable for tools that will work both hot steel and other hot metals.

No. 66 HIGH SPEED (oil-hardening). A general-purpose high-speed cutting steel with excellent red-hardness.

BIG 8 BETHLEHEM STEEL **HANDLE 97% OF TOOL STEEL JOBS**

FOR over 60 years, America's railroads have specified and used Standard Shield Brand Drills, Reamers, Taps, Dies, and Cutting Tools. Today the railroads are among our largest customers.

Standard Shield Brand Tools are purchased by the tens of thousand for the repair, maintenance and construction of that equipment with which the railroads are doing the world's greatest transportation job.

On the basis of this record, we invite you to send us your tough jobs. Chances are our engineers can select from our stock of thousands of tools a drill, reamer, tap or cutter of the type that will reduce costs and speed production in your shop. No obligation, write to

THE STANDARD TOOL CO.

CLEVELAND

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CHICAGO STORE
552 W. WASHINGTON BLVD.

To Speed Production

STANDARDIZE

METAL CUTTING OPERATIONS

HAVE you considered the advantages of *Standardizing* your metal cutting tools —drills, reamers, taps, dies and milling cutters?

By specifying Standard Shield Brand Tools of the types illustrated you are assured of:

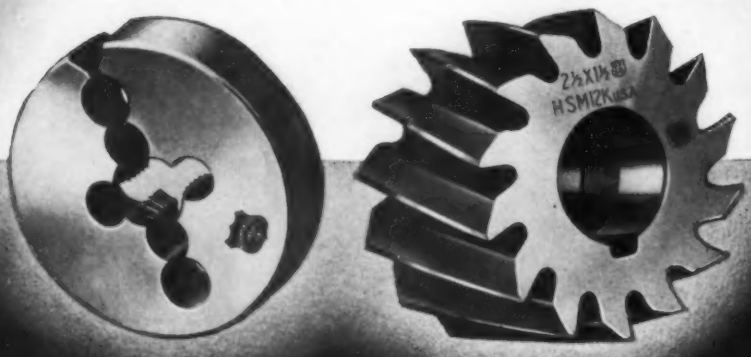
Uniformity of Quality in these types of cutting tools.

Uniformity of Performance in metal cutting operations—

Thus assuring like standards of operation for metal cutting operations in all departments of your plant.

The net result is uniformity of production, of operation and reduced costs. Our engineers will welcome your inquiry.

Leading mill supply dealers throughout the United States furnish Shield Brand Drills, Reamers, Taps, Dies, Milling Cutters and Special Tools.



THE STANDARD TOOL CO.

CLEVELAND

NEW YORK STORE 94 READE STREET | DETROIT STORE 8555 HAMILTON AVE. | CHICAGO STORE 553 W. WASHINGTON BLVD.

Steve is in there "plugging" for you —still

BACK in pre-induction days when he was working for your Industrial Supply Distributor ◆Steve kept plugging to find the things you had to have to keep your war output moving on decent schedule.

You didn't see Steve very often—but you profited by his help every day. He knew of sources for the materials you had to have —and he spent hours on end running them down by 'phone. He was plugging for you then and he is in there plugging for you still.

Today your Industrial Distributor's man-supply is reduced too, but he is organized to help you shortcut a lot of your routine. He can purchase everything that you and many other large users require, on a single shipment from the factory—can draw on stock for deliveries to you as needed.

Take him into your planning. Today and *every* day—

Telephone your ◆I◆S◆D◆ FIRST!

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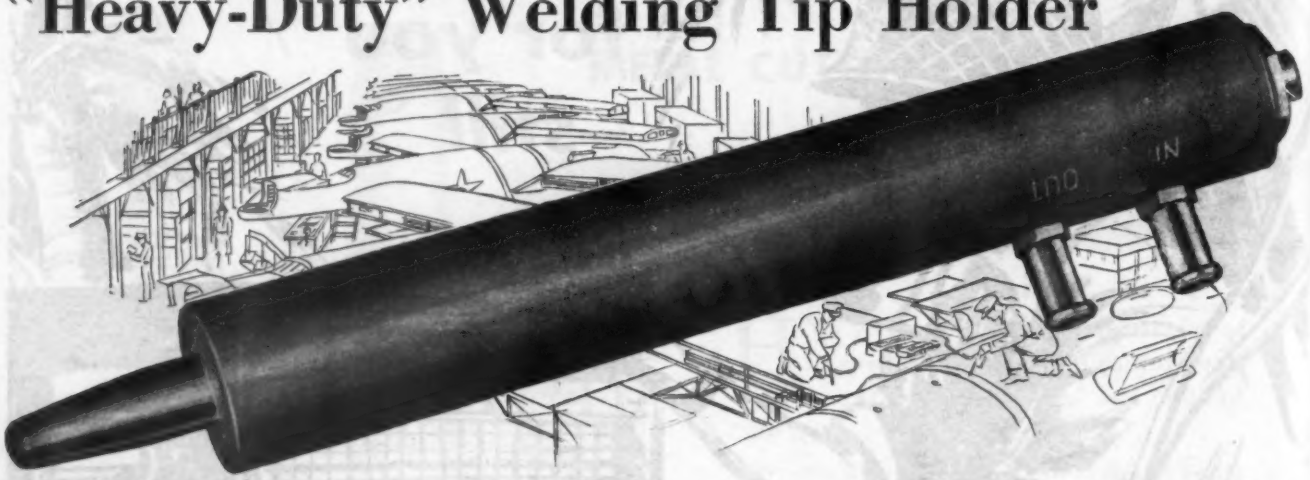
For Tough Jobs...

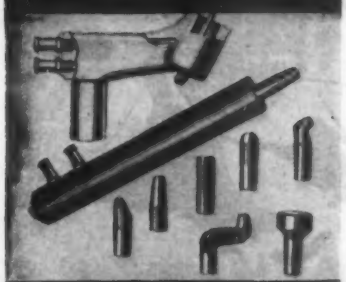
P. R. MALLORY & CO. Inc.

MALLORY

"Heavy-Duty" Welding Tip Holder



Speedier Production
Less Down Time
Better Welding
Lower Cost



SPOT WELDING TIPS AND HOLDERS

FLASH, BUTT, PROJECTION WELDING DIES

SEAM WELDING ROLLS

Today's increased production calls for resistance welding tip holders that are able to stand up under gruelling service. Mallory answers the need with a product that lives up to its name—the Mallory "Heavy-Duty" Holder.

Carrying an increased flow of water or other coolant, this streamlined, compact tip holder keeps tip temperatures down and increases welding quality and efficiency. Its single piece housing, built to protect vital interior parts, also eliminates coolant leakage troubles.

In addition, the holder features an ingenious knockout device that allows the tip to be ejected quickly by a slight hammer blow at the other end. It has a packing nut, readily accessible at the rear, for quick replacement of packing or adjustments.

The Mallory "Heavy-Duty" Resistance Welding Tip Holder is one of several especially built by Mallory for the tougher jobs of wartime. It has what it takes to stand the gaff.

To get the latest technical information on resistance welding electrodes (for ferrous or non-ferrous metals), write today for your copy of the Mallory Resistance Welding Data Book.

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Buy War Bonds

P. R. MALLORY & CO. Inc.

MALLORY

Standardized Resistance Welding Electrodes

SCORE

GRINDING 50
MILLING 10

* Another test run won by CORTLAND CHUCKS and SEGMENTS

Here is an unusual Cortland War Production Test Run . . . not against competitive chucks and segments, but against the production time of *milling*.

TEST FACTS: The gun mount division of a great war producer . . . using a Blanchard No. 18 Vertical Surface Grinder . . . Wheel Speed, 750 R.P.M.

WORK: Bearing caps . . . Drop Forgings . . . 50 pieces per table load.

PURPOSE: The purpose of this test was to determine if Cortland Chucks and Segments could grind off .193 stock faster than it could be removed by milling. It had taken 2 minutes per piece in milling.

RESULTS OF TEST: *Cortland Segments mounted in Cortland Chuck ground 50 pieces in 19-1/2 minutes! That's boosting production five times!*

Much of your milling work may be ground . . . perhaps at greater speed and lower cost . . . certainly with required accuracy—when you use Cortland Chucks and Segments. Why not call in a Cortland Grinding Engineer to discuss the matter . . . or write for latest illustrated bulletin, giving complete details of Cortland Chuck and Segment performance.

CORTLAND GRINDING WHEELS CORP.
5 Cortland Street Chester, Massachusetts

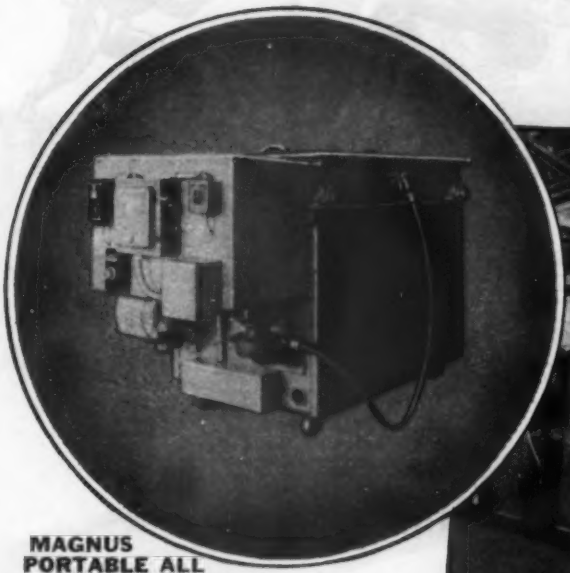
Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments

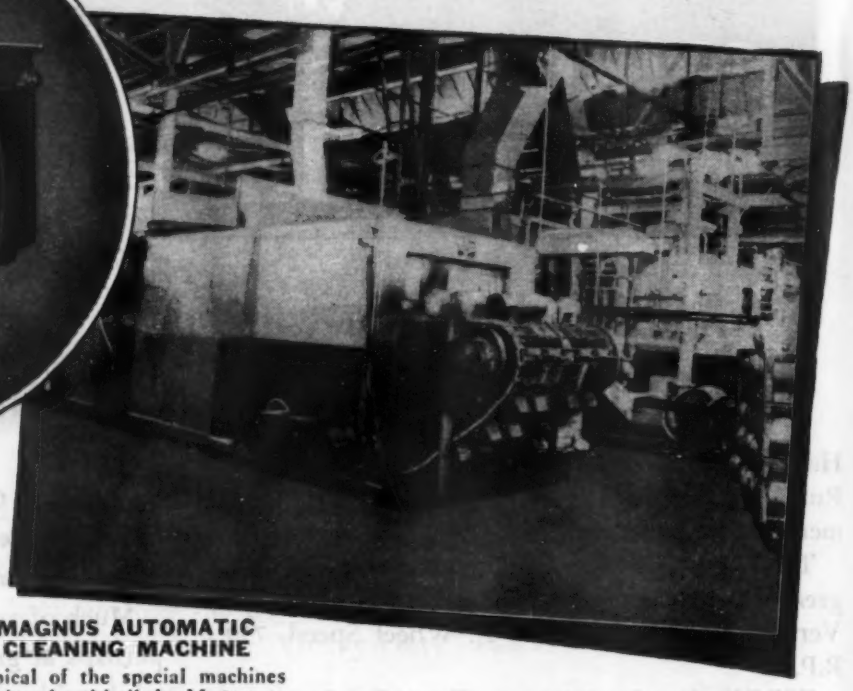
For Chemically-Clean Steel Parts - - - Magnus 94XX

The Alkaline Cleaner with Super Wetting Action



MAGNUS PORTABLE ALL PURPOSE MACHINE

for cleaning parts and assemblies faster and better can be used with Magnus 94XX. This machine, with its unusually effective agitation system is also made in larger sizes.



MAGNUS AUTOMATIC CLEANING MACHINE

typical of the special machines designed and built by Magnus to meet individual requirements. Here an Emulso-Dip preclean can be followed by an alkaline cleaner suitable for spraying.

MAGNUS METHODS MATERIALS AND MACHINES

This complete manual on the methods, materials and machines used for metal finishing operations of all kinds is a text book that will prove mighty useful in your work.

WRITE FOR A COPY.

Magnus 94XX is a special alkaline cleaner for steel, with greatly increased wetting action. It wets faster and more thoroughly and penetrates surface capillaries of the metal to remove all traces of foreign matter.

This highly economical cleaner is used not only in still tanks and dip-type washing machines, but in electrocleaning tanks as well. Here its ability to provide adequate current carrying capacity and thus insure the high current densities required by modern anodic cleaning is particularly valuable.

Unique Brightening Effect

Steel parts cleaned with Magnus 94XX have an unusually bright white appearance. This cleaner can be used without precleaning to obtain a chemically clean surface in many cases. Faster wetting in the cleaning operation also insures better, speedier and more complete rinsing. (94XX is not adaptable to spray-type washing machines, due to foaming properties).

You will find it well worth your while to give Magnus 94XX a thorough tryout on your steel parts and assemblies. We will be glad to give you the details on our liberal 30-day trial offer.

Magnus

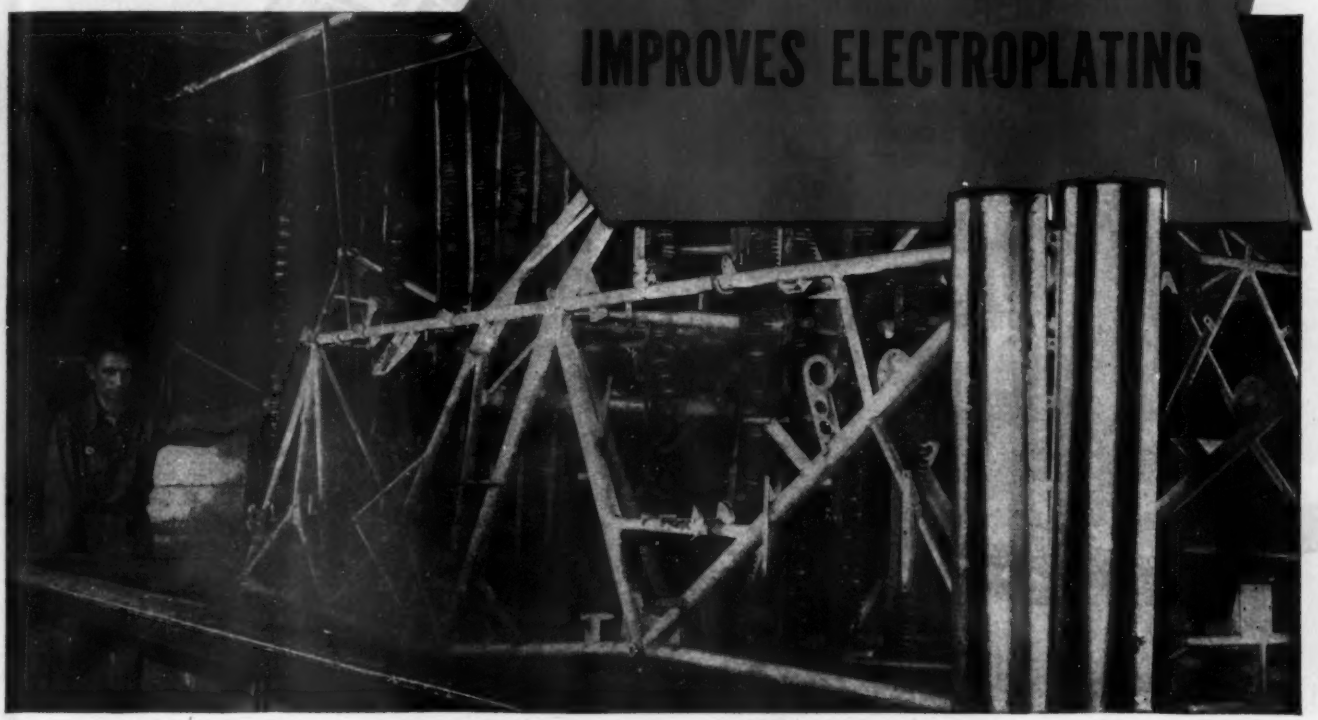
MAGNUS CHEMICAL COMPANY · 60 SOUTH AVENUE · GARWOOD, N. J.

CLEANERS-METHODS-MACHINES

Prosolv *B*

offers outstanding advantages

NEW TURCO CLEANER IMPROVES ELECTROPLATING



APPROVED FOR THE BULLARD-DUNN DESCALING PROCESS

Equally effective in still tank and electro-cleaning

So positive are the advantages of Turco Prosolv *B* that prominent electroplaters have switched to this new cleaner immediately following tests *although they had considered satisfactory the materials they had been using.*

Turco Prosolv *B* insures the chemical and physical cleanliness that is essential to 100% bonding to steel of zinc, cadmium, chromium and other plate. It removes every trace of oil, grease, smut, paint and rust preventive compound. It contains no soap; leaves no deposit. Rinsing is complete, even though parts may have dried.

A highly concentrated product, Turco Prosolv *B* is 100% active. Every particle works; there is no waste.

As this new cleaner is effective in both still tank and electro cleaning, it simplifies stocking and plant procedure where both processes are employed.

Try Turco Prosolv *B* for stripping tin deposits formed during the Bullard-Dunn descaling process. A standard cleaning tank may be used for this. Call the Turco Field Service Man for details on this specially formulated electro and still tank cleaning material which is doing such a notable job the nation over. Write today.

Follow Prosolv B with Turco Descaler This second step in preparing steel for plating is as necessary to a perfect job as the primary cleaning operation in Prosolv *B*. Any rust, mill, welding or heat-treat scale will prevent bonding of plate. Turco Descaler removes these without attaching the base metal. Thus the combination of Turco Prosolv *B* and Descaler insures quality plating at low cost. Let us furnish full details.

Rust Bar treatment for unplated portions. Partially plated parts, if treated with Turco Rust Bar, are well protected from corrosion during indoor storage although subjected to severe conditions. A thin film of Rust Bar is resistant not only to airborne water vapor, but also to corrosive gases and other types of corrosive agents.

TURCO

Turco

Write Dept. AM-9

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IS YOUR FLOOR A CHUTE-the-CHUTE?

Correct it with *SPEEDI-DRI*

OIL-SWEATING, greasy, slippery floors are no longer a hazard in plants which have discovered SPEEDI-DRI. SPEEDI-DRI provides no skidding and no kidding! This oil-thirsty, fire-retardant compound promptly soaks-up ingrained grease . . . without scrubbing. Simply spread SPEEDI-DRI, in every department, on oily areas; then sweep it up ... and, with it, all greasy soakage. Wood, concrete, and metal floors regain their original surfaces. Aisles are brightened, cleaning-labor saved, plant morale lifted, production speeded. Join the rush of industry's top-flight maintenance-men to the use of SPEEDI-DRI, the original oil and grease absorbent. Write for literature and FREE SAMPLE—today!

SUPPLIERS: East—Refiners Lubricating Co., New York 1, New York.
Midwest & South—Waverly Petroleum Products Co., Philadelphia 6, Pa.
West—Waverly Petroleum Products Co., Russ Bldg., San Francisco 4, Calif.

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OIL AND GREASE ABSORBENT

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Insure Drilling Accuracy with Universal Drill Bushings

Universal Drill Bushings save valuable tool drills. Super finished bores insure accuracy and unexcelled wearing qualities. All standard sizes available. Write for catalog.

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FRANKENMUTH, MICHIGAN

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Brass or Steel, Cut Thread
Class 3 Fit

Waltham is also equipped to furnish all types of
SPECIAL MACHINE SCREWS and SCREW MACHINE WORK
manufactured to special order.

Write for Catalog and Price List.

WALTHAM SCREW CO.
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WRITE US

If you've ever had clutch trouble

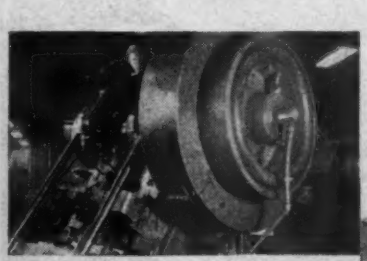
You'll want to know more about the clutch that controls power by air pressure—the Fawick Airflex Clutch.

It works without arms or levers or toggles or springs. No moving parts—nothing to lubricate or adjust. Low maintenance expense. Misalignment corrected automatically.

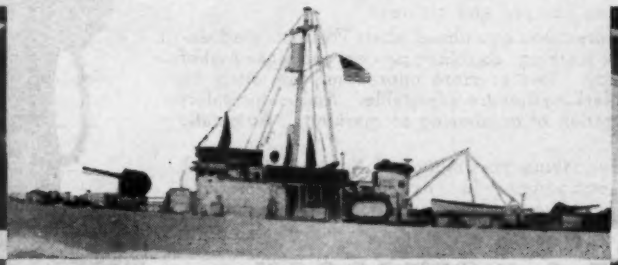
This new type of clutch just can't cause any of the conventional clutch troubles.

Proof? Certainly—in thousands of naval and merchant marine Diesel drives—in heavy duty drives for all kinds of machinery with tough jobs to do!

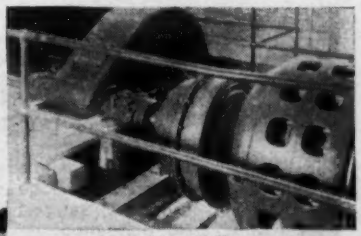
If you need a *trouble-free* Clutch, Brake or Flexible Coupling, our engineering department will be glad to make recommendations.



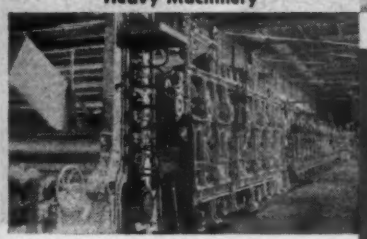
Heavy Machinery



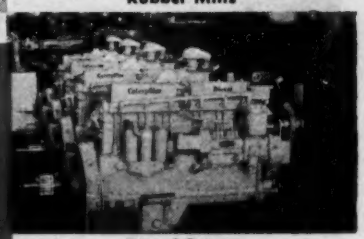
Destroyers — Tugs — Landing Craft



Rubber Mills

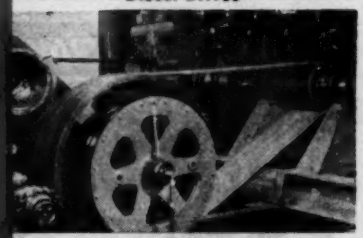


Paper Machines



Diesel Drives

Drags and Cranes



Oil Field Machinery

Mine Hoists

Steel Mills

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Chuck Manufacturer Proves Economy of Noblewest Precision Marking

500% PRODUCTION INCREASE

Jacobs Manufacturing Company, makers of chucks, found that Noble & Westbrook's rapid production equipment increased their marking production 500%. Quality too, was improved . . . impressions becoming sharper and clearer.

Noble & Westbrook precision equipment offers you many advantages for faster, better marking: Its rolling process combines higher speeds with accuracy. Two or more operations can often be combined in one. Marking dies are adjustable. Automatic safety devices and registration of numbering or marking. Automatic unloading.

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SPECIFY Precision LATHE ATTACHMENTS

IMMEDIATE DELIVERY FROM STOCK

For 10" Atlas & Logan, 9" South Bend ½" Capacity Lathes, etc.

Order from your dealer or write us for literature.

- Increases ½" collet capacity lathes to ¾".
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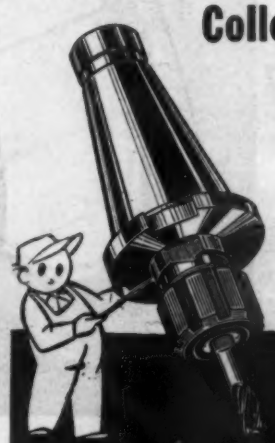
GENERAL DIE-STAMPING-TOOL COMPANY

PRECISION COLLET DIVISION 262-272 Mott St., N.Y. 12, N.Y.

Grip tools tight — with Universal Collet Chucks



Universal Collet Chuck with National Milling Machine Taper Shank. Also available with B & S, Morse and Straight Shank.

Universal Collet Chucks grip tools as strong as solid steel. Automatic release spring and allowance for tool feed-out. Handy wrench grip. Ground threads and reduced locking effort. Write for catalog.

Army-Navy "E" Flag Two Stars

Fighter Plane Given by employees

20%

20% Employees Bond deductions

UNIVERSAL ENGINEERING CO.
FRANKENMUTH, MICHIGAN

WHAT you learn today, you can benefit from tomorrow. This is importantly true in the surface preparation of metals before electroplating or other finishing operations.

For example ... perhaps you are among the thousands of concerns that TODAY are using various specialized Oakite materials in the production of ordnance matériel and other war supplies. You know the rigid, exacting tests to which these Oakite materials were put ... you NOW are confidently depending on them for the many advantages they provide.

SO KEEP THEM IN MIND! Because the SAME scientifically engineered degreasing materials ... and many NEW ones soon available ... when applied as directed by our Technical Service Representative, will give you the SAME speedy, satisfactory, low-cost precision results for cleaning peacetime products TOMORROW.

Put Oakite Service to Work on Your War-to-Peace Change-Over Planning!

Whether you plan to fabricate new products, make your regular products from new materials or merely reconvert to pre-war manufacture, you will find Oakite "know-how" and technical experience a valuable aid in making tests and selecting the RIGHT material that will keep unit costs low and your post-war production on a fast, smooth-flowing basis. Inquiries and problems invited.

Manufactured only by

OAKITE PRODUCTS, INC., 18 Thames Street, NEW YORK 6, N. Y.

Technical Service Representatives in All Principal Cities of the United States and Canada

OAKITE MATERIALS...METHODS...SERVICE

CLEANING FOR EVERY CLEANING REQUIREMENT

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STRAND FLEXIBLE SHAFT MACHINES

Used Throughout the Nation
High Quality Only
Vertical and Horizontal
⅛ to 3 H.P.

Attachments for Hundreds of Operations

Rotary Files
Ground Cutters

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N. A. STRAND CO.
500 No. WOLCOTT AVE., CHICAGO 40, ILL.

This precision gage serves ALL THREE purposes!

Measures precision bores to fractions of .0001"

COMTORPLUG

By using Comtorplugs, you are able to set up a "matched gaging" procedure whereby machine operators have adequate gaging equipment to maintain close tolerances, and the same precise gage is used by the inspectors. Numerous airplane, automotive and other high-precision plants are now set up on this basis, and will carry its advantages over to their peace-time operations. Comtorplug equipment is readily available. Investigate.

Request Bulletin 29

THE COMTOR CO.
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GRINDING WHEEL DRESSERS

Desmond Cutters

Desmond Hex Dresser

We manufacture a complete line of Dressers and Cutters. Write for copy of catalog "A".

DESMOND-STEPHAN MFG. CO.
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ARMY E NAVY

DIES GEO MET RIC **TAPS**

Right in the Lead

THE GEOMETRIC TOOL CO.
NEW HAVEN 15, CONN.

Famous for

- ACCURACY OF THREADS
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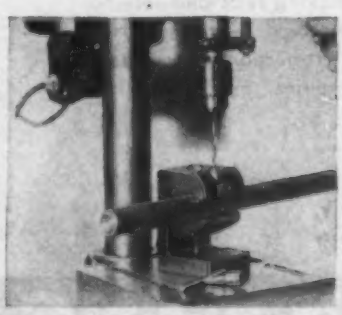
Bulletins available: General Purpose Die Heads, Insert Chaser Die Head, Threading Machines.

H&G DIE HEAD

See our Advt. on page 288 Aug. 17, '44 American Machinist

THE EASTERN MACHINE SCREW CORP., 20-40 Barclay St., New Haven, Conn.
Los Angeles: A. C. Behringer, 324 N. San Pedro St., San Francisco: Guy Reynolds, 464 Vernon St., Oakland, Canada: F. Barber Machinery Co., Toronto, Canada.



3" Capacity, 4⅝" x 3⅛" x 3¼". Alloy Iron Casting. Furnished with ⅛" Drill bushing. Layout scale engraved on body above "V".

HANDY AS A POCKET IN YOUR SHIRT NECESSARY AS YOUR DRILL PRESS

Universal Center Drill and Mill Vise gives absolute cross center drilling. The Vise which is precision ground serves as toolmaker's work holder for precision drilling, and 90° layout drilling without removal of work from vise. It is adaptable for drill jig on small runs and can be used with hand drill, assuring true and accurate holes.

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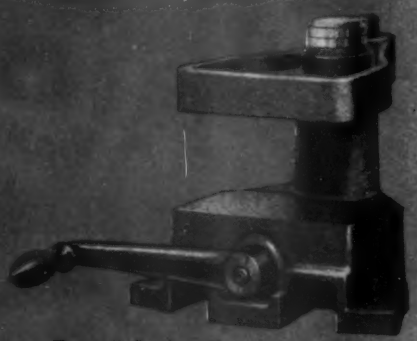
SPEEDING METAL
FROM RAW FORM TO *Victory*

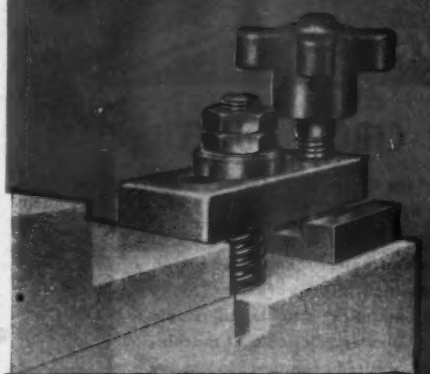
THE BIG 3 - SIEWEK

RAPID CLAMPING DRILL JIGS
PROGRESSIVE *SHEAR-CUT* END MILLS
CLAMPS AND DETAILS



Type E Spring Jig

Type C-12 Spring Jig



No. C-40 Clamp

Shear Cut End Mills

Metal first takes shape under the tools made by Siewek ... tools which are speeding the production of war goods in factories all over the county; saving time, labor and material in the shop.

Siewek Rapid Clamping Drill Jigs are quickly and easily set up. Simple, material saving adapters allow the use of standard jigs on a great variety of jobs.

Progressive Shear Cut End Mills are precision made of the finest materials. They feed accurately; give adequate, rapid chip clearance for uniform cutting action; minimize chatter, and permit working to extremely close tolerances.

Siewek Clamps are designed to require a minimum number of details to fit them to a job. This skilled engineering of these fixtures have resulted in savings of 50% to 75% of the time ordinarily required to meet your conditions.

Write today for catalogs and full information on any or all of the big 3 Siewek production tools.

SIEWEK TOOL DIVISION
OF DOMESTIC INDUSTRIES, INC.
2345 Wolcott Street, Detroit (Ferndale Station) Michigan
Distributors in Principal Cities

Manufacturers of PROGRESSIVE SHEAR-CUT END MILLS

(Photograph courtesy Kellogg Switchboard and Supply Co.)

KESTER CORED SOLDERS TAKE THE *Kinks* OUT OF PRODUCTION LINES

- If you are plagued by an unsolved solder problem, consult Kester engineers. These experienced men *know* solder the way a surgeon knows anatomy. They can help you speed up production, improve your product and minimize service difficulties.
- Numerous types of Kester flux-filled solders are available for industrial use. Each is scientifically correct. Kester Rosin-Core Solder, used for electrical work, has a patented plastic rosin flux that will not disintegrate, cause corrosion or injure insulating material.
- In the wide range of Kester Cored Solders there is one exactly suited to every production program. Our engineers will be glad to study your problem and make recommendations. Write to them at any time—there is no obligation.

☆ BUY WAR BONDS ☆

KESTER SOLDER COMPANY
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Eastern Plant: Newark, N.J.
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Finest Quality FOR 45 YEARS 1899-1944 KESTER SOLDER

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STANDARD FOR INDUSTRY

"SPECIALS"

MADE TO YOUR SPECIFICATIONS

REED GROUND & LAPPED
KNURLS

We specialize in designing and manufacturing special knurls to meet your individual specifications.

More than 100 Standard Styles and Sizes IN STOCK. Available in either Carbon Steel or High Speed Steel.

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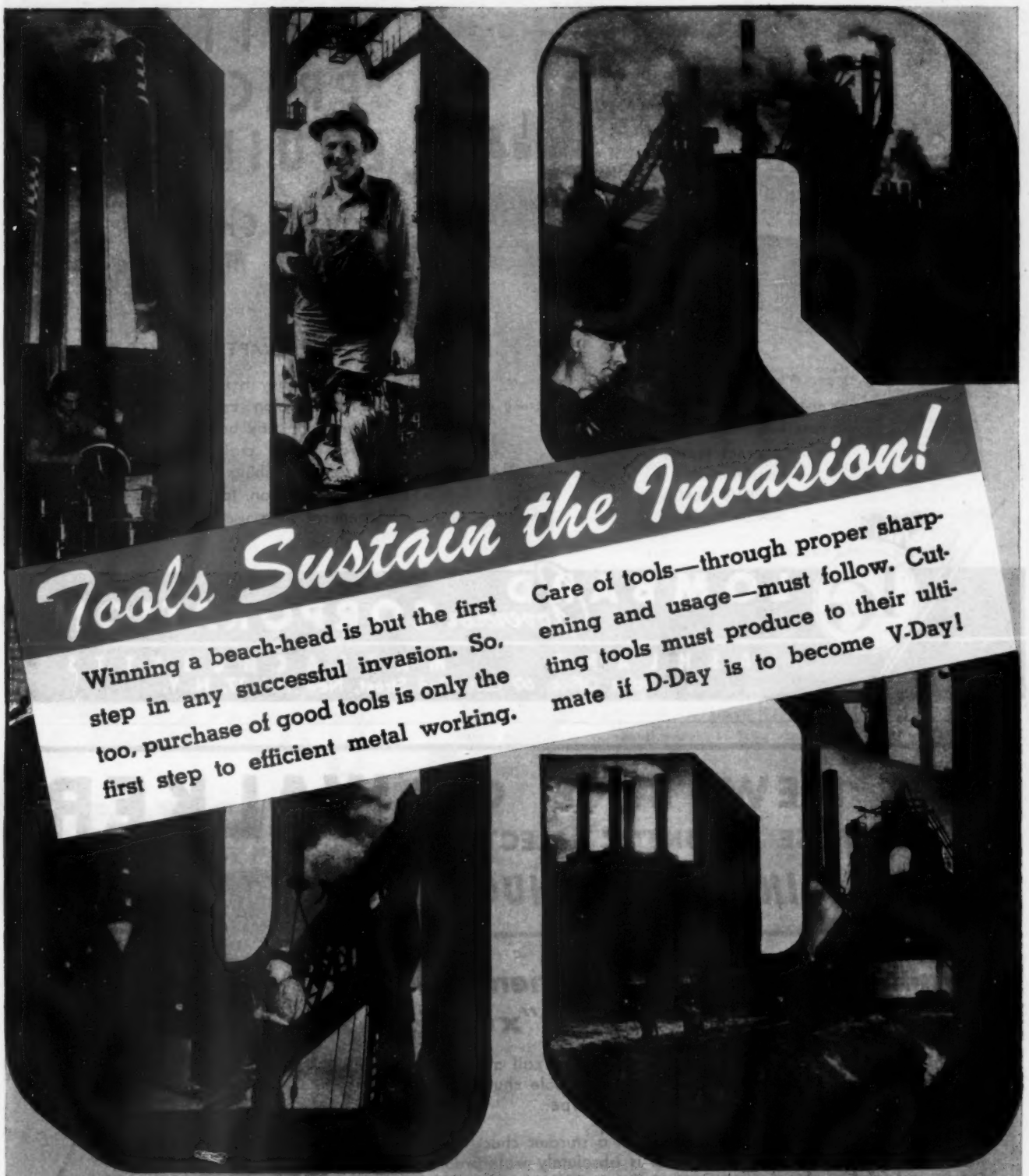
REED SMALL TOOL WORKS
WORCESTER 2, MASSACHUSETTS

Now! CUT HOLES IN SHEETS THE QUICK, EASY WAY

RIEGER CIRCLE CUTTER

Set the arm of the Rieger Circle Cutter for the radius of the hole. Chuck the tool in a lathe, drill press, or electric drill. In no time at all you can cut clean holes in sheets of metal, plastic, composition, fibre, or wood. Save time, trouble, material! Arm is adjustable for 2" to 8" diameters. Capable of machining holes of desired contours in heavy plates. Circle Cutter is heat-treated alloy steel ground to size. Models with ½" x 2" straight shank or No. 2 Morse taper shank available for immediate shipment. Ask for literature.

THE RIEGER MFG. CO.
Dept. AM-9. MIAMISBURG, OHIO



Tools Sustain the Invasion!

Winning a beach-head is but the first step in any successful invasion. So, too, purchase of good tools is only the first step to efficient metal working.

Care of tools—through proper sharpening and usage—must follow. Cutting tools must produce to their ultimate if D-Day is to become V-Day!

National cutting tools, sold by leading Mill Supply Distributors, are tools of character.

NATIONAL

NATIONAL TWIST DRILL & TOOL — ROCHESTER, MICH., U.S.A.

TWIST DRILLS
REAMERS, HOBS
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SPECIAL TOOLS

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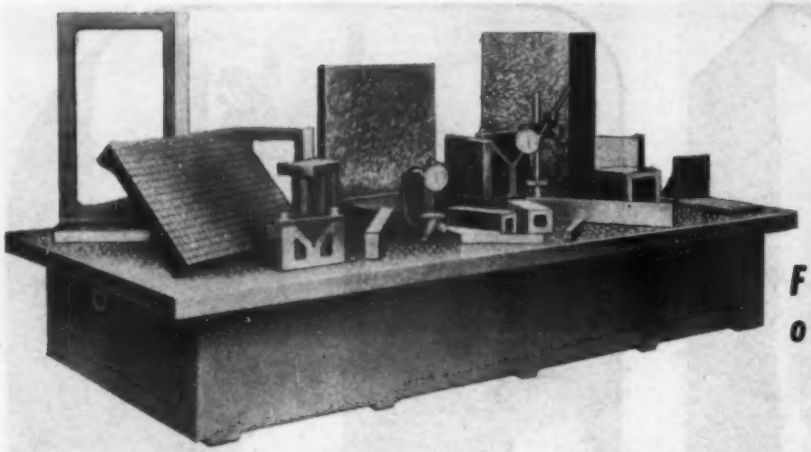
DETROIT AND ROCHESTER, MICHIGAN

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.



VITAL PRECISION EQUIPMENT

For the Critical Field of Close Machine Work

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PROMPT DELIVERY

Long-life accuracy is the outstanding feature of Lombard Precision Equipment. For years this fine reputation has been carefully guarded by Lombard master craftsmen in the machining and careful finishing so necessary for equipment for inspection, tool-room, layout, assembly and general shop use.

Write for illustrated "Precision Equipment" catalog with detail listing of stock numbers, sizes and approximate weights.

SURFACE PLATES	DIAL GAUGES
BENCH PLATES	PARALLELS
LAPPING PLATES	V-BLOCKS
ANGLE PLATES	STRAIGHT EDGES

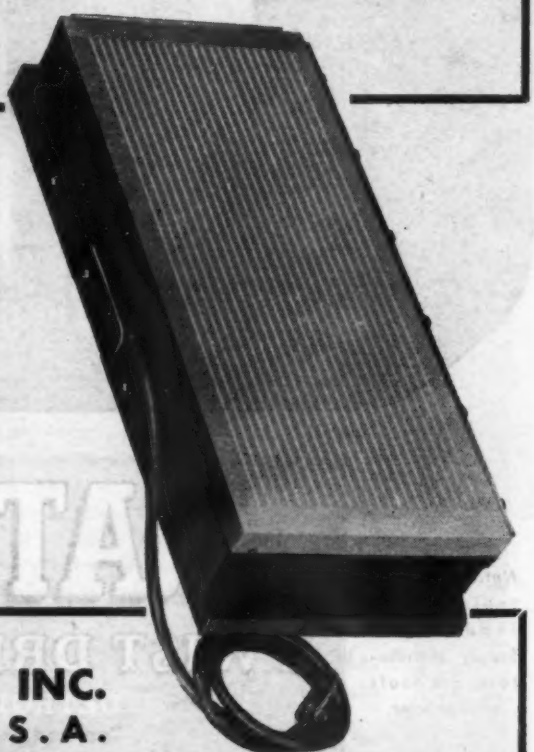
LG LOMBARD *Governor* CORPORATION

ASHLAND MASSACHUSETTS

Sales Office: 60 East 42nd Street, New York 17, N. Y.

THE NEW LINE OF WALKER

ALL - PURPOSE MAGNETIC - ELECTRIC *LONGITUDINAL POLE CHUCKS*



Available for prompt shipment in all sizes from 4"x10" to 12"x60"

In announcing these chucks, WALKER also wishes to call attention to the metal working industry that its line of bar pole chucks has been superseded by this new longitudinal pole type.

Improvements in the design have resulted in a sturdier chuck that withstands a lot more abuse and which is absolutely waterproof. This new chuck has also proved a more efficient method of holding work. The same fine pole divisions which were a feature of the now outmoded bar pole design are retained in the new line, with all the advantages which this construction has demonstrated.

Send at once for complete detailed information.

O. S. WALKER CO., INC.

WORCESTER, MASS., U.S.A.

Now, Accurate Reflex Torquing— *faster than thought...*

WITH THIS NEW WRENCH, accurate torquing becomes fast and automatic. When the exact "set" torque is reached, the SENSORY Mechanism sends three simultaneous nerve impulses to the operator's muscular control center, instantly releasing the tension by reflex action. Recorded through three channels—sight, sound and feeling—all three at once—or by any one of them individually, automatic reflex torquing is obtainable under every working condition, in spite of operator's physical handicaps—deaf, blind, or maimed, or degree of inattentiveness.

This new Sensory feature is built into standard STURTEVANT Permanently Accurate Torque Wrenches—the indestructable torque measuring wrench universally used for production, inspection and wherever torque must be accurately gauged. In the Sensory Wrench not a single basic Sturtevant design or construction feature has been sacrificed, though reflex-speed has been added.

7 YEARS OF DEVELOPMENT

As the torquing of vital screws, nuts and threaded parts became a standard production operation, the need for *fast*, sturdy and accurate Torque Wrenches became apparent. As the manufacturers of 80% of the torque wrenches in use STURTEVANT has long been aware of this need. As creators of the Sturtevant Design Principle which eliminated all fragile mechanisms, springs, gears, glass dials and delicate parts and made possible sturdy, practicable tools that remained permanently accurate in the hands of ordinary workmen, ***we were determined that our production wrench would have to be not only fast-operating but also sturdily built and above all permanently accurate.*** As experienced tool makers we also knew that this wrench would have to give more than visual readings to meet every torquing situation.

For more than seven years STURTEVANT engineers have been working intensely on this problem . . . have been exploring, testing, designing, redesigning, perfecting and rejecting innumerable "speed" and "limiting" torque wrenches of all known and many new designs and principles. From this tireless research has evolved a new thing in high speed production torque wrenches, the ***STURTEVANT SENSORY*** Torque Wrench—a wrench that in use is faster than thought, still is a true STURTEVANT Torque Wrench that will stand all ordinary shop abuse and yet remain dead accurate.

THE STURTEVANT *SENSORY* TORQUE WRENCH

This new wrench closely resembles the familiar STURTEVANT Torque Wrench in appearance. It's the same size for capacity, weighs about the same also. It too can be dropped into the regular tool box with safety, will withstand the every day abuse given bench tools by careless workmen and still remain "dead accurate" even after long, hard service. It has the same legible STURTEVANT Dials which can be visually read from all working angles. Because experience has shown that visual readings not only provide a quick "check-look", but give the operators the assurance and *confidence* that they *must* have and insist upon, our engineers maintained this feature unchanged in the Sensory Wrench. But here is the difference—whereas the Sturtevant Torque Wrench depended *solely* on visual reading to determine accurate control of applied torque on caps, screws, bolts or threaded parts, the new STURTEVANT SENSORY Torque Wrench embodies two other features—two other safe-guards that help the operator maintain accurate torque at reflex speed—*"sound" and "feel."*

These Sensory features work as follows: A finger is provided which can be set at any desired signalling point. And from there on, until re-set, as torque is applied with the wrench, at the exact instant the "set" torque is reached, the sensory action (1) Sounds a loud and distinct click and (2) imparts a definite strong impulse to the hand. Thus, through *three* senses, sight, sound *and* feeling, the operator automatically releases (by reflex action) his pull on the wrench (even before the conscious mind reports it) making torque both fast and dead accurate. Here, through three channels instead of just one, the operator is conscious that the release point is reached, in spite of himself. Stop and think what accurate "reflex torquing" means:

1. It speeds up production while maintaining accuracy of torquing far beyond that possible with any other fast-operating production wrench.
2. Permits accurate torquing in dark or "blind spots," in deafening factory din, and from any working angle under *all* working conditions.
3. It enables physically handicapped workers, who may have one of these three senses impaired (blind, deaf or maimed) to do accurate torquing.

And for you engineers who like figures, read the results of the following field test made on an actual production line of a large engine builder using three 100 foot-pound Sturtevant Sensory Wrenches:

Type of Wrench	Description of Operation	Torque Limits in Ft. Pounds	Number of days in Service	Number of Nuts or Screws Tightened
S-100	Tightening Cylinder Head Cap Screws (21 per engine)	60-65	79	379,447
S-100	Tightening Connecting Rod Nuts (12 per engine)	40-45	79	227,520
S-100	Tightening Main Bearings (8 Main Bearing Cap Screws per Engine)	80-85	67	138,240

NOTE: Set only once, the day they were put on the job, these wrenches were checked periodically and found to be dead accurate throughout the test—no repairs, no re-settings, no adjustments.

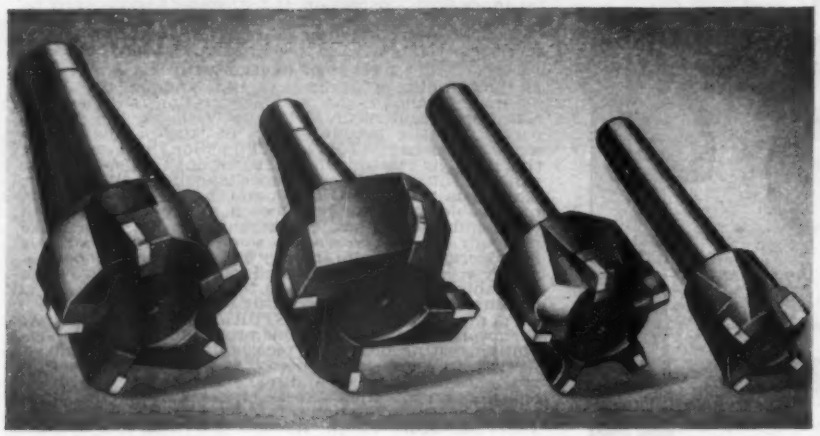
Think what this means to industry . . . to your business in speeding up war production . . . what it can mean to you in post war competition. Any operator can now torque *accurately* without watching a dial—can torque automatically, even the wrench automatically "re-cocks" itself after each pull.

P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

Buy More War Bonds

Cal-Cutters are cost cutters!

. . . FOR WAR OR PEACE-TIME PRODUCTION

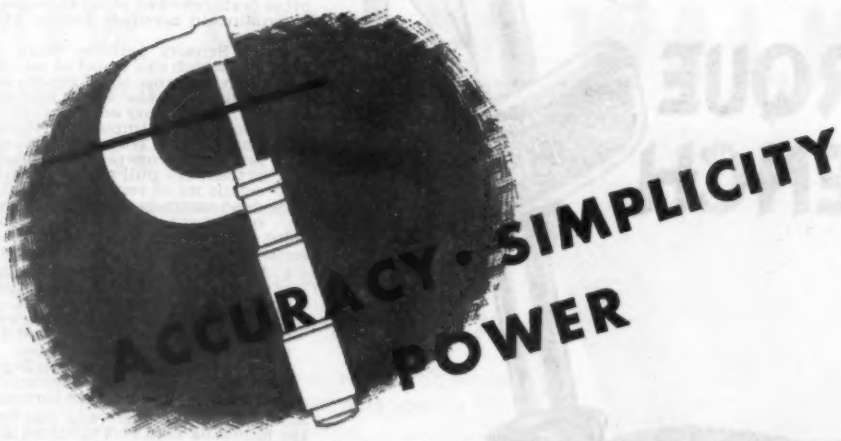


When war requirements give way to peace-time production, manufacturers again face that all-but-forgotten bogey, competition. Successful competition *means building at lower cost than ever before . . . more work per man hour . . . more production per cutter dollar.*

When that day arrives, *Cal-Cutters will lower peace-time manufacturing costs* as well as they increase today's wartime production. Output from the same milling machines is even now being jumped from 5 to 15 times . . . floor-to-floor time cut from 45 minutes per piece to 3 minutes per piece! Hundreds of records attest to Cal-Cutters' greater production ability.

If you need greater war production *now* or have an eye on the competitive future, remember—you can mill it faster, mill it better and mill it cheaper with carbide-tipped CAL-CUTTERS!

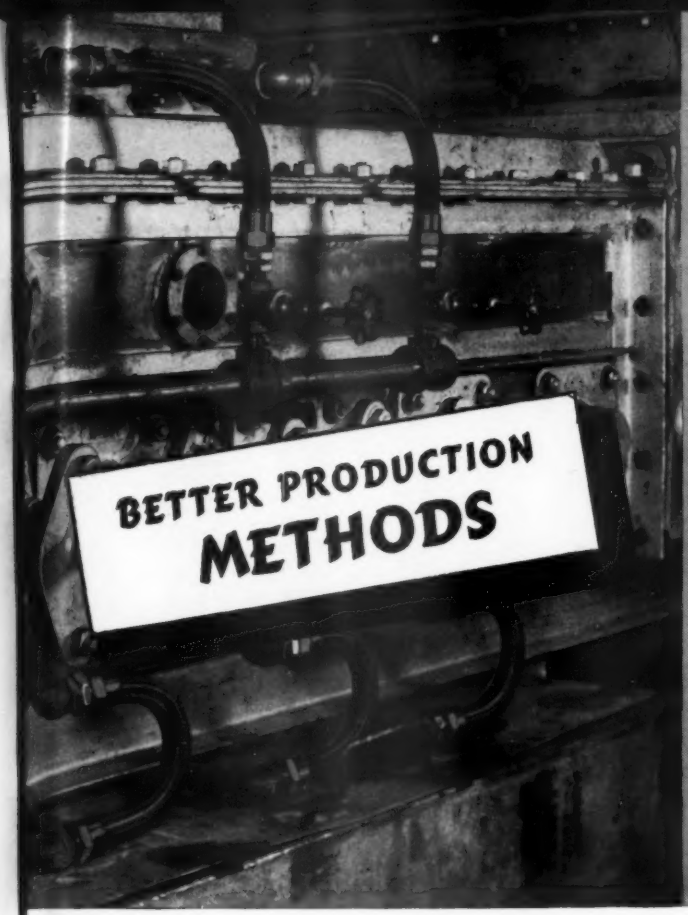
MACHINERY MANUFACTURING COMPANY
1915 EAST 51st STREET • LOS ANGELES 11, CALIFORNIA
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS and JIG BORERS, SHAPERS and GRINDERS

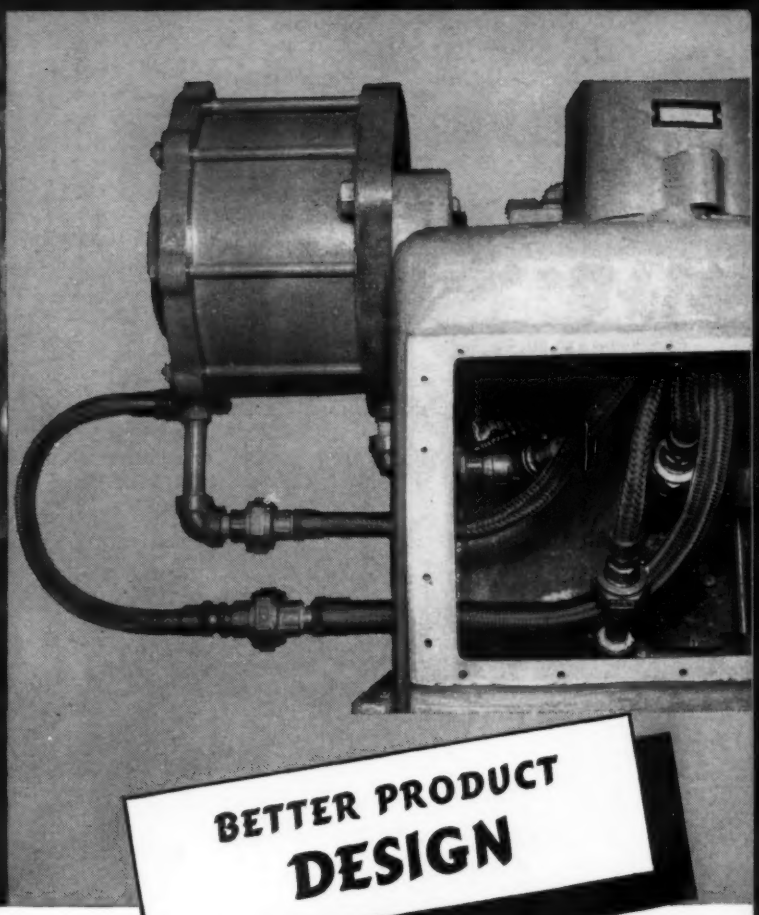


BETTER MACHINE TOOLS = GREATER PRODUCTIVITY
GREATER PRODUCTIVITY = INCREASED PROSPERITY

SIBLEY

MACHINE & FOUNDRY CORPORATION
SOUTH BEND 23, INDIANA





WITH AMERICAN *Flexible* METAL TUBING

The contribution of American Flexible Metal Hose and Tubing to the solution of many war production problems has been noteworthy. Not only have these products been a boon to machine and product designers, but they have been instrumental in developing entirely new methods of production.

Considering that "American" Flexible Metal Hose and Tubing has been obtainable only by war industries, it is safe to say that its influence in manufacturing and new product design will be greatly extended when its use becomes unrestricted. Certainly, for conveying anything that will flow through a pipe or tube and where flexibility is needed, there's no product more dependable than American FLEXIBLE Metal Hose and Tubing.

There are two distinct methods by which "American" products are made . . . "SEAMLESS" which is corrugated from rigid tubing to make it FLEXIBLE . . . and STRIP WOUND hose made from strip metal, carefully profiled and wound with each convolution securely locked with the next.

Seamless Flexible Metal Tubing has no joints, no seams, no welds . . . it is as leakproof as the rigid tubing from which it is made. Where absolute tightness is essential, Seamless should be specified.

Strip wound Flexible Metal Hose is made in several types, with or without packing. Asbestos, cord, rubber or wire packing is used for tightness, in accordance with the end use specified.

There are few industries today that cannot improve methods or products with "American". For connecting moving parts and conveying gas, water, oil, steam, fuel, etc. . . . for absorbing vibration, taking up expansion and contraction by insertion of a section of "Seamless" in rigid pipe lines . . . for easy assembly and disassembly . . . for maintenance, for connecting misaligned tappings and, of growing importance, for the lasting operation and sales appeal of many products.

Check your methods and products. See why American Flexible Metal Hose and Tubing will do a better job. Machine and product designers especially should investigate the advisability of getting it on the drawing board . . . "right" from the start.

NEW "SEAMLESS" CATALOG READY

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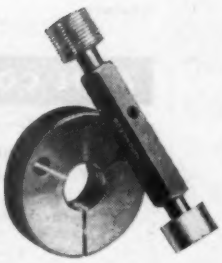

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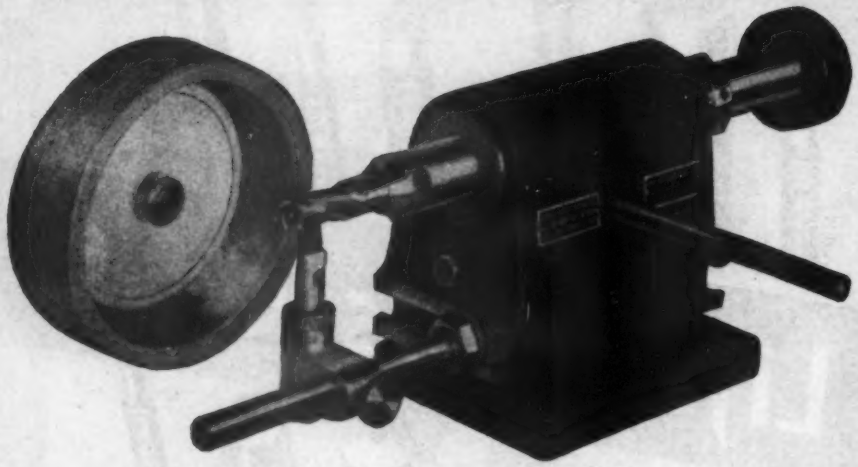

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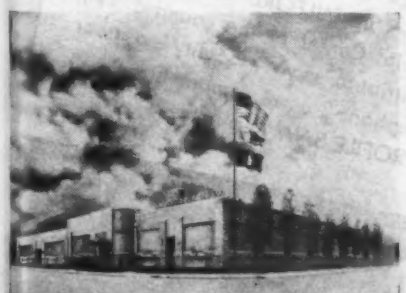

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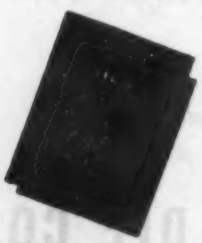

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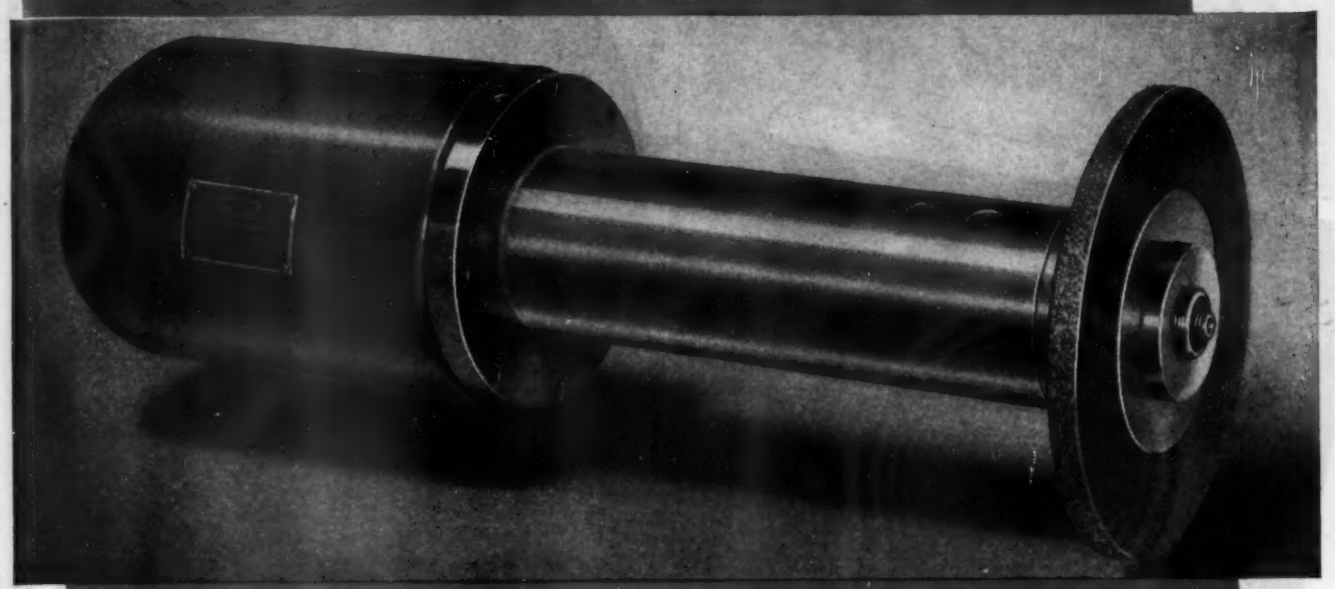

and get finer finishes—more production

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The performance and operating advantages of this new Spindle justify immediate replacement of existing spindles on all makes of 6" x 18" surface grinders. Its sealed-in motor may be 220 or 440 volt — 2 or 3 phase — 60 cycles, or 550 volt — 3 phase — 60 cycles. It operates horizontally, vertically or at any angle so it may be used to equally good advantage on boring mills, planers, milling machines or other machine tools for special work.

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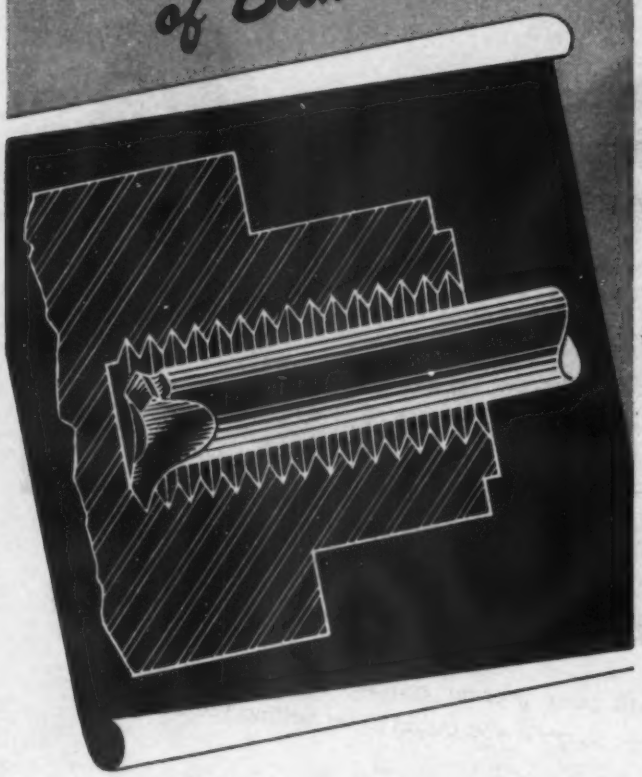
To the Bottom of Blind Holes



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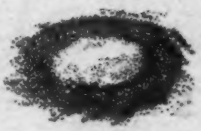

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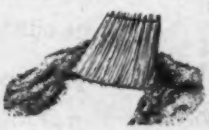

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It seems a far cry from the claw hammer to a huge rolling mill, where huge red-hot ingots are transformed as if by magic, into wafer-thin sheets . . . yet the principle remains constant. You couldn't beat out miles of thin steel plate with a carpenter's hammer . . . nor could you pull out a hard driven spike with your fingers. Both are examples of the lever's theory that a minimum of energy correctly applied can not only move the world . . . but can make the world a better place to move in.

BROACHING is a further development of this principle. Eliminating needless operations and speeding up production, it requires *less* energy to produce *more* . . . resulting in fewer man and machine hours to produce each part. Parts mass-produced in a fantastic variety of complex shapes and sizes to uniformly close tolerances. It will pay you to investigate the possibilities of broaching in your plant.

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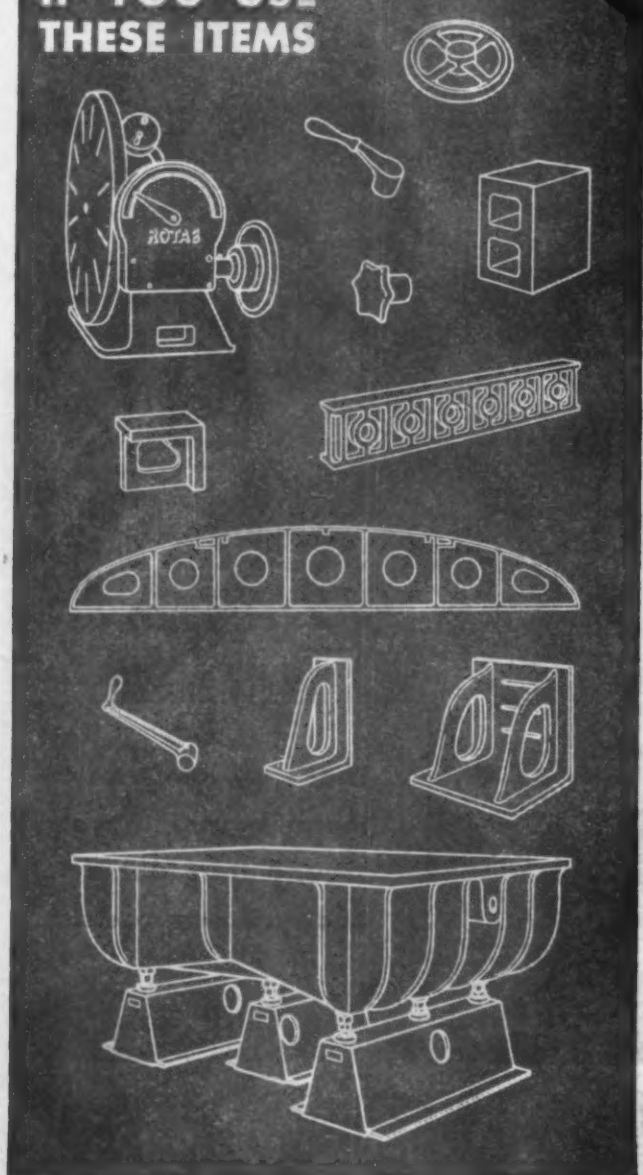

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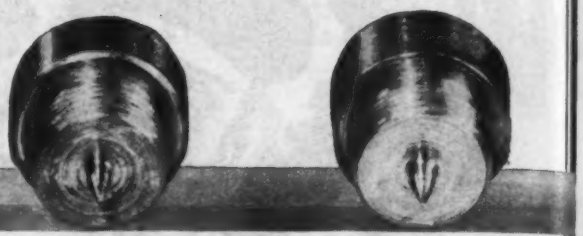
before and after



How the right cutting fluid pays

FIRING PINS or cylinder barrels . . . shells or ship shafts . . . plants that make them use cutting fluids—most often *good* cutting fluids. Often, however, one cutting fluid is expected to fit every job. Usually it won't, for when the operation—speed, feed, tools or stock are changed a new set of conditions exist. That means the cutting fluid factor must be considered carefully on every job—and the *right* fluid determined for it. Such consideration pays well.

The stainless steel parts illustrated above are a good example. It is obvious from these unretouched illustrations that the piece on the right has the better finish on both face and thread. This improvement over the left hand piece was due solely to a change in cutting oil to the *right* oil for the job. And this *right* oil proved to cost 14c per gal. less, on the machine. In this case a simple blend of Stuart's Thred Kut 99 was the answer—but it might have been any other of several Stuart Products.

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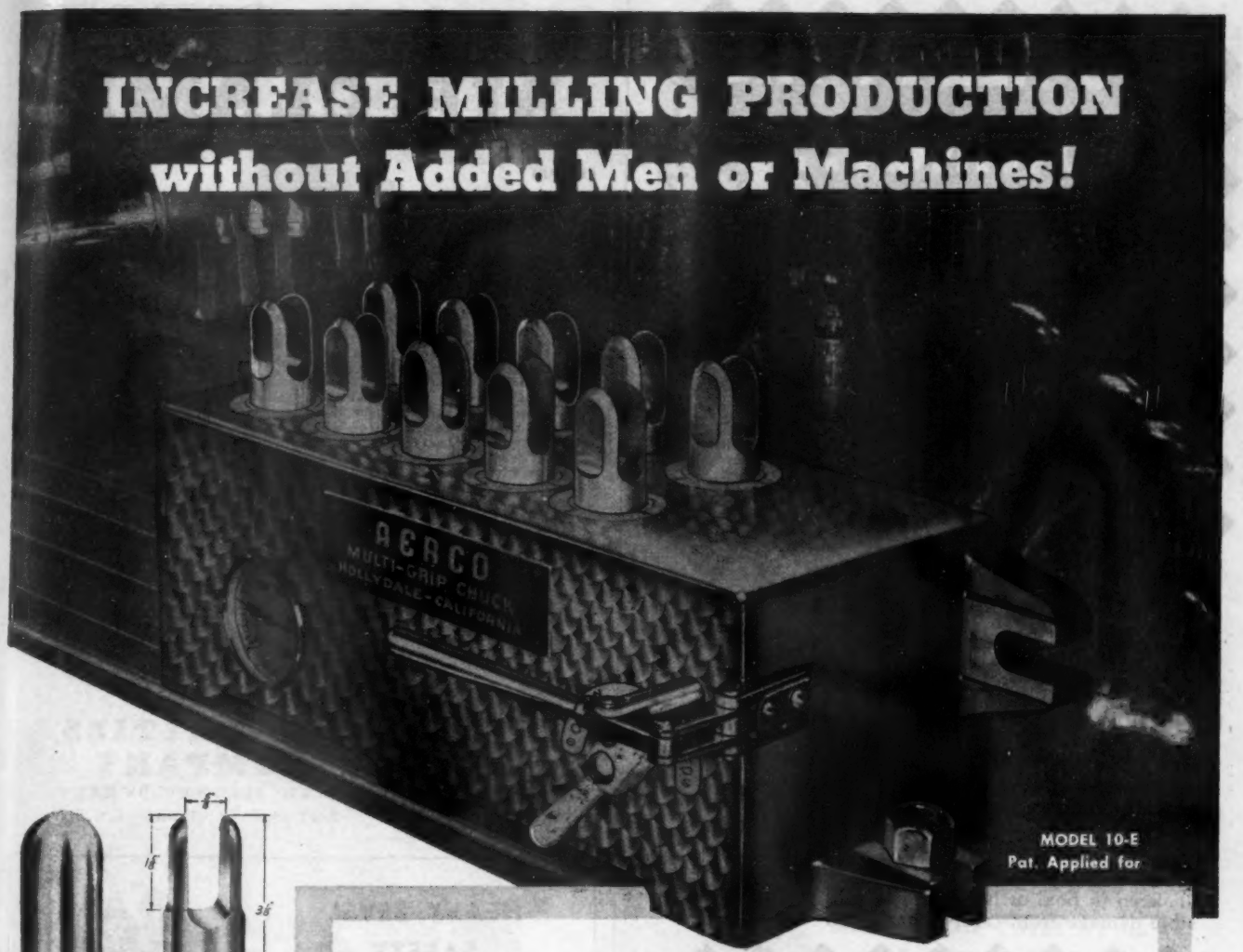
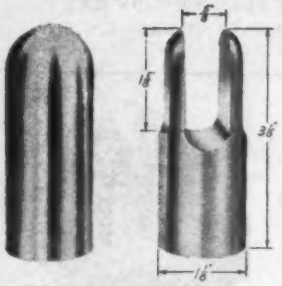


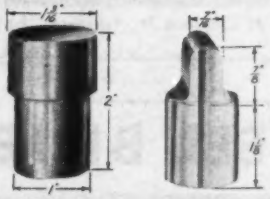
MODEL 10-E
Pat. Applied for



Before After

Aluminum Parts

These aluminum parts were milled upon the Aerco Multi-Grip Chuck at the rate of 355 per hour (floor to floor) as compared with single milling operations of only 71 per hour.



Before After

Chrome Steel Parts

These parts, high heat treated of Chrome-moly, were produced at the rate of 62 per hour (floor to floor) on the Aerco Multi-Grip Chuck. Individual milling time was 15 per hour.

These parts milled with the use of the Aerco Multi-Grip Chuck show its versatility.

with the AERCO HYDRAULIC MULTI-GRIP CHUCK

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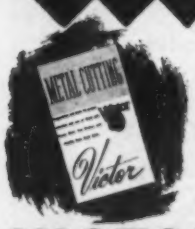

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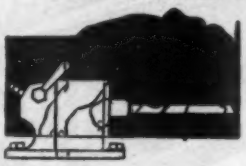

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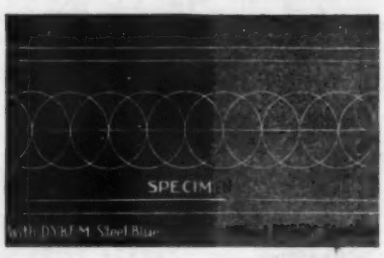

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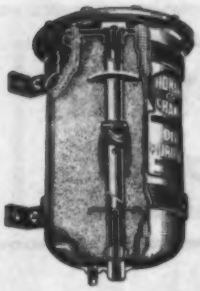
"Talmo"	Latrobe Electric Steel Co.
"S. T. M."	Simonds Saw and Steel Co.
"Mo-Tung" . . .	Universal-Cyclops Steel Corp.
"8-N-2"	Vanadium-Alloys Steel Co.
"Vul-Mo"	Vulcan Crucible Steel Co.

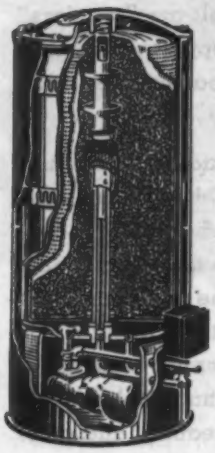


HONAN-CRANE SMALL PURIFIERS

for direct connected installation on hydraulic machine tools, presses and many types of mobile equipment. Purifiers are furnished with legs or mounting bands. Will remove abrasives, sludges or acids as fast as they are liberated by operating equipment.

HONAN-CRANE

• A complete line of proven oil purification equipment that will effectively handle any problem of the purification of dirty or contaminated industrial oils. These purifiers guarantee maximum protection for operating equipment.

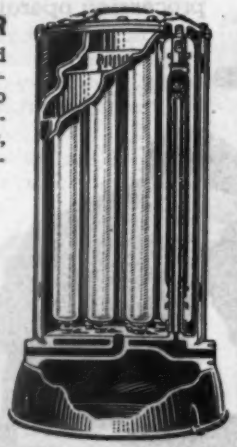


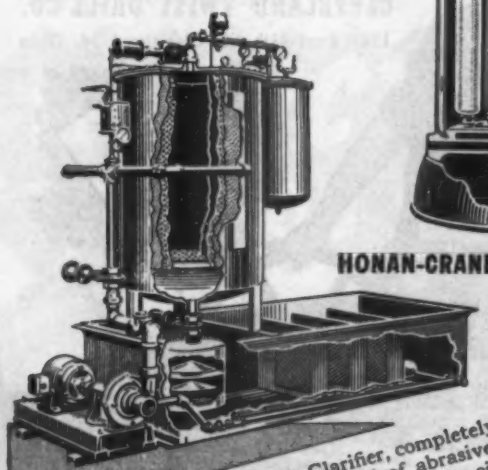
HONAN-CRANE "CONTINUOUS" OIL PURIFIERS

will remove solid and soluble contamination from oil as fast as it is liberated by the operating equipment. Gives positive control of the neutralization factor in Turbine oils. Standard units available for Gas and Diesel engines up to 20,000 H. P., for Turbines up to and over 10,000 gallons, also for Hydraulic, Insulating and all kinds Industrial oils.

HONAN-CRANE "M" TYPE PURIFIER

will handle *"high flow"* demanded in certain types of installations. Cartridge type refills, double decked to conserve space. Ideal for marine installations. Can be used with electric, steam or hot water heaters. Streamlined in design and full insulated.





HONAN-CRANE AUTOMATIC CLARIFIER

Honan-Crane Automatic Clarifier, completely automatic unit for the removal of abrasives from Cutting, Grinding, Honing, Boring oils and coolants. Unit is self cleaning and very little liquid is lost.

Special Equipment such as Mobile Insulating Oil Units, Threadgrinding Coolant Purifiers, etc., are also available.

Write for complete specifications and engineering bulletins on Oil Purification equipment, stating particular kinds of oils you are interested in purifying.

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205 WABASH AVE., LEBANON, IND.

SUBSIDIARY OF HOUDAILLE-HERSHEY CORPORATION

Made to your blueprints with precision accuracy and fine workmanship, A.C.E. Hi-speed and Carbide-tipped cutting tools provide long cutting life. Send us your inquiries for prompt estimates. Bulletin on request.

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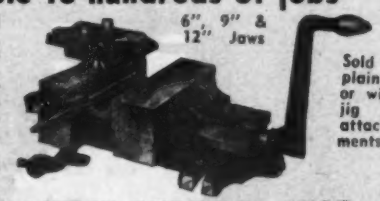
31745 MOUND ROAD, WARREN, MICH.

Adaptable to hundreds of jobs

With its many special jaws, drill guides, stops, etc., etc., this vise is always widely useful, whether under wartime or peace-time conditions, as a jig or fixture for drill press, planer, shaper, radial, miller, grinder. Sizes from 124 lbs.



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KNURL HOLDER FITTING LATHE TURRET

Its "Adjust-angle" feature enables you to produce many patterns of straight, spiral and checkered knurling using only straight knurls. Handles work up to 2½" dia.

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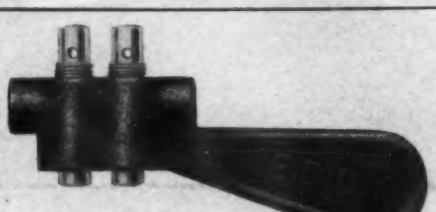
GRAHAM MFG. CO., 87 BRIDGE STREET EAST GREENWICH, R. I.

NEW EDDY ADJUSTABLE INSIDE (Go, No Go) GAGE



Replaces: Plug Gages—Size Blocks—Telescoping Gages Spring Calipers—Planer Gages—Keyway Gages

Each gage is complete in case with 12 rods of various lengths:

To gage all sizes between 1" and 2"	$26.00
To gage all sizes between 2" and 4"	32.00
To gage all sizes between 4" and 6"	36.00
All three to gage between 1" and 6"	85.00

EDDY MANUFACTURING CO.

321 PINE STREET PAWTUCKET, R. I.

HOT News on a COLD Subject!

Threadwell COLD-TEMPER Taps

ONE HUNDRED AND TWENTY BELOW—the temperature at which Threadwell **Cold-Temper** Taps are treated—nevertheless generates the hottest thread production news of the day!

Threadwell **Cold-Temper** Taps have supreme resistance to wear. They're harder yet more ductile than ever. They're ideal for tapping plastics or abrasive metals. They guarantee you more and better threads at lower cost.

Superior performance and longer life are frozen into Threadwell **Cold-Temper** Taps for keeps. There's a sound and scientific metallurgical basis for it (which we'll gladly explain, if you're interested) but the *results* in your own shop will interest you most. Ask your Threadwell distributor or write us at the factory for the cold facts on Threadwell **Cold-Temper** Taps.

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• With this modern tool you can handle keyseating jobs not suitable for keyseating machines on any of your drill presses or radials. Keyseats with parallel sides, accurate in depth and in perfect alignment with bore axis are assured.

The National Keyseating Miller mills, keyseats in one cut. It can be used on taper holes, offset holes, blind holes and for taper keys. Work clamping is unnecessary. We also manufacture oil-grooving millers.

Made in twenty-six different diameters from ½" to 3½". Several widths of cutters can be used in each size.

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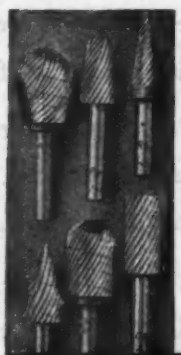

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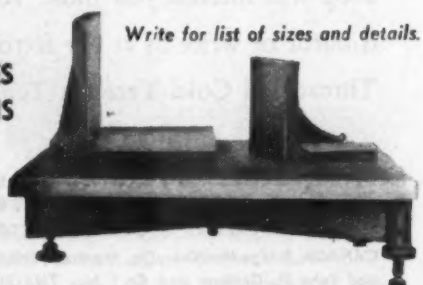

Surface Plates and Inside and Outside Angle Irons normalized, first grade gray iron, nickel iron, or meeninite castings. Can be furnished finished, machined, hand-scraped or ground.

H. & H. MACHINE TOOL CO., Waltham, Mass.

Peacetime efficiency in war production . . . how some industries have achieved it

AT NO TIME in history have industrial men worked closer with suppliers and with each other than during the period of conversion to all-out production for war.

In no field has this cooperativeness been more productive in adding to machine efficiency, saving scarce equipment, and in reducing waste than in lubrication. Through the efforts of industrial management, many maintenance problems were brought to light which Standard Oil Lubrication Engineers and plant men were able to solve to the benefit of all.

The following examples may suggest ways in which cooperation with the Standard Oil Lubrication Engineer will bring worthwhile savings to your plant in materials, maintenance, and productive labor.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

PLEASE TURN THE PAGE FOR DETAILS

LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATION ENGINEERING . . . LUBRICATIO

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Cutting oil *News* letter

Practical suggestions from the field on how cutting oils and coolants are being used by midwest machine operators to lick tough wartime jobs.

SEPTEMBER, 1944

Making equipment on hand do the job that was needed was a frequent problem when plants were converting to war work. The situation may be repeated in reconverting to peace time production. The experience of an Indiana plant may be helpful in either case. The job was deep-drawing an aluminum cup with a ⅜ inch radius at all edges. Breakage at the edges was a problem, principally because the minimum speed of the press was too fast for the job. The plant men were aware of this—but that didn't solve the problem. The job had to be done—on that machine. The only remedy was to find a stamping compound that might help.

Materials that were first tried gave discouraging results. The scrap pile mounted and usable parts were few and far between. A Standard Cutting Oil specialist saw the job. He recognized the unusual demands and recommended an unusual cure—Acme Base Oil Extra Heavy. It did the trick—parts are now being produced on this press with less than 1% scrap. Acme Base was an unusual answer but it was the *right* answer at the *right* time.

Big savings for big soluble oil user. When converting to war production most plants wisely spared no expense to avoid trouble. On that premise a manufacturer of 105 mm. shells used a rich emulsion of an expensive soluble oil. This oil is used in large quantities employing a central mixing tank, which supplies oil to the machines, and is agitated by an outboard motor. When the plant got rolling, tests of other soluble oils were made. Superla Soluble Oil was one of them. With it, mixes as high as 25 to 1 are doing finished work satisfactorily. These lean mixtures of Superla cut soluble oil costs to one-third—a four figure saving yearly at this plant.

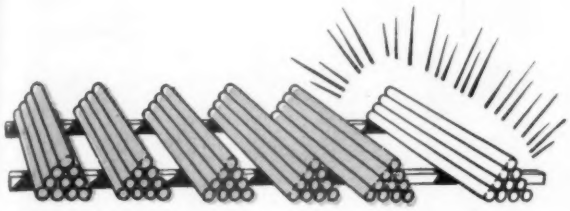
Triple saving surprises manufacturer. Torn threads in machining stainless steel stock posed a problem for a screw machine manufacturer in Michigan. Spoilage cut materially into profits. The waste of scarce material was even more important at the time. Poor tool life was also a problem. A real effort was made to find the answer. A number of cutting fluids were thoroughly tested—Stanicut 137 BCS being the last one. It was last because no more were tried—it more than answered the need.

With Stanicut, threads improved and rejects were practically eliminated. Production jumped 47% on the operation. Tool life was tripled. Three blessings where the manufacturer had looked for but one.

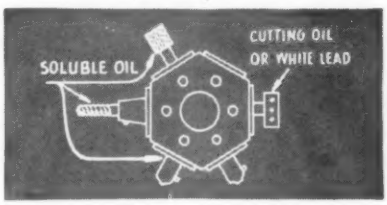
Machining time cut in half. An Indianapolis plant had trouble machining a rack without tearing or scratching the metal. This stainless steel rack had 65 teeth, .040 inch deep of 64 pitch and ¼ inch face. Good results with ordinary oil were obtained only when the machine worked at lowest speeds. Better results were obtained when carbon tetrachloride was added, but it made the operator sick. Stanicut 309 BCS was tried. Reports show it gave excellent results at faster speeds, cut machining time in half, and had no ill effects on operators.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

Die on way to doubling guaranteed production. In order to speed cold nosing on shells, a Nebraska plant used a special alloy die guaranteed to turn out 300,000 shells without excessive wear. Stanostamp "C"—a stamping compound used widely because of the protection it gives to dies—was applied to the job. After 500,000 shells were nosed, the die was still as true as when it started. It was on its way to more than doubling the production guaranteed.



Five piles of steel stock rusted—one pile didn't at a Michigan tube manufacturing plant. The six shipments of steel came from six different mills. In ordinary times the user probably wouldn't have tried to solve the mystery. He would have changed his source of supply and ordered the steel that didn't rust. But these aren't ordinary times so he tried to find the reason. It was simple—the manufacturer of the rust-free stock protected it with Stanorust. Let *us* make suggestions before *your customers* do. Look into the advantages of Stanorust for protecting the parts you manufacture.



One oil all-around on turret lathe. Carboloy tools on a turret lathe required a soluble oil, but a threading operation on the same lathe required a cutting oil to give reasonable die life. This meant swabbing the die with cutting oil, which presented a cleaning problem on the part manufactured.

At another plant in machining steel bolts on a turret lathe it was necessary to use white lead on the threading operation to get smooth threads, although soluble oil was needed for the other operation. Both plants switched to Stanicool H.D. Soluble Oil at the suggestion of the Standard Oil Engineer. In both cases threads improved and tool life was lengthened without sacrificing the cooling quality needed, when Stanicool H.D. was used on all operations.

For the want of a nail the battle was lost. Here's the counterpart—in reverse—of the story of the General who lost the battle because his horse lost his shoe. A contract deadline was made because the right lubricant was found.

This war contract called for producing a certain number of very large units in 105 days. A small but important part of the unit was produced on a large horizontal milling machine. If this machine could be speeded up 10% the necessary production schedule could be met. But the manufacturer experienced trouble with a worm gear on this machine and hesitated to increase the speed because of excessive wear.

The problem was explained to a Standard Lubrication Engineer. He recommended a special type lubricant. After a thirty-day run, which was the average life of the worm gear an inspection was made. No appreciable wear was found. This saved a 24-hour shutdown for replacement. Production was resumed and another run of 70 days was made without repairs. The contract was completed in 100 days.

Gasoline Powers the Attack... Don't Waste a Drop!

What are your problems in machining and lubrication?

Take the time to explain your problems to a Standard Lubrication Engineer. He may have a number of suggestions that will help you save manpower, materials, and equipment needed now. Call any Standard Oil Company (Indiana) office or write 910 South Michigan Ave., Chicago 80, Illinois, for the Engineer nearest you. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

★ LUBRICATION ENGINEERING

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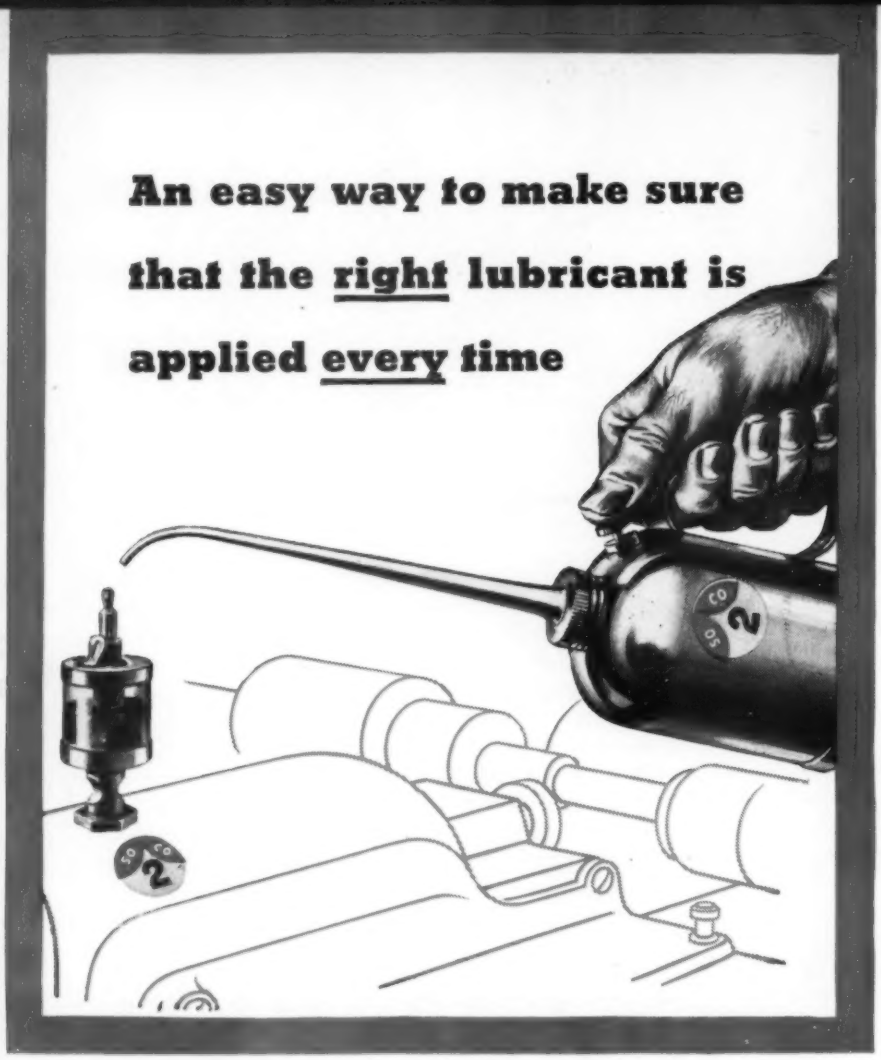


Standard Coded Lubrication Service

CODED LUBRICATION is one of the most important forward steps to insure better lubrication that has been made in many years.

In spite of past progress in producing better lubricants and the time spent developing better methods of application, one question still remained—was the *right* lubricant used on *every* application *every* time?

Now Standard Coded Lubrication Service answers this question completely. A simple lubricant numbering system makes it practically impossible for a conscientious oiler crew to misapply lubricants.

Standard Coded Lubrication Service is described at the right. Note these advantages over other systems you may have tried.

1. Only two color combinations and simple numbered decals are used to designate various lubricants.
2. The color combinations, red and yellow, and blue and yellow are easy to distinguish in any light.
3. The numerals are easy to recognize and remember even by those who do not know English.
4. Only one simple record is needed, which is made up when the system is installed. There are no complicated forms to fill out or keep up to date.
5. The code numbers used, apply only to the lubricant used in your plant and not to SAE or the maker's brand or grade numbers.

Send for the booklet fully describing Standard Coded Lubrication Service. If your plant is located in the Middle West a Standard Oil Industrial Service Representative will be glad to discuss this system with the men in charge of your lubrication.

Gasoline Powers the Attack . . .
Don't Waste a Drop!

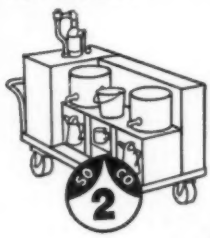
FREE BOOKLET TELLS HOW

this simple code system may be fitted to your lubrication plan:

Flexibility and adaptability are outstanding features of this system. Note that it is a *numerical* system not to be confused with complex "color scheme" systems. Here are the few simple steps in this plan. A code number is assigned to each lubricant in your plant. Numbered decalcomania transfers are furnished by us in quantities sufficient to be applied to:

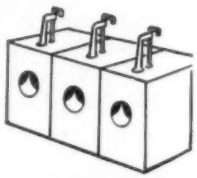
—every point of lubrication on every machine

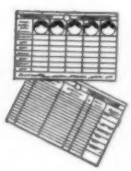
—every grease gun or oil can used in servicing equipment



—every container or drum on your lubrication cart where they are used

and every barrel, drum, or storage tank in your oil house.





Machine Record Cards: Where desired, a supply of machine record cards (4″ x 6″) is provided.

Lubrication Chart: For control purposes, a card is provided to list, by brand name and code numbers, all lubricants used in the plant. This card is used by stock clerk or stockkeeper to enable him to requisition products by brand name, and to mark barrels with the correct code numbered decal.

This Booklet gives full details of how Standard Coded Lubrication Service can go to work in your plant. Ask your Standard Oil Man for a copy. Talk it over with him and the men in charge of your lubrication. See how this plan fills a gap in your lubrication program. Call the nearest Standard Oil Company (Indiana) office, or write 910 S. Michigan Avenue, Chicago 80, Illinois. In Nebraska, write Standard Oil Company of Nebraska at Omaha 2.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

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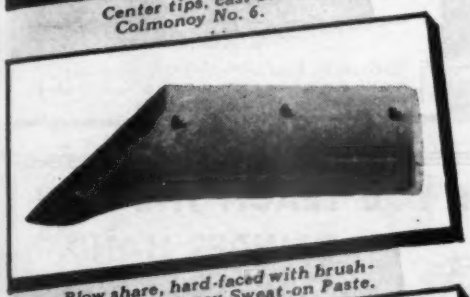
HARD FACING ALLOYS

Center tips, cast of Colmonoy No. 6.



Plow share, hard-faced with brush-coated Colmonoy Sweat-on Paste.

Pump shaft sleeves and wear rings, of Colmonoy No. 6.

High pressure valve stems and seats, hard-faced with Colmonoy No. 4.

On the war front—COLMONOY, applied to wearing parts of army ordnance equipment, has increased its efficiency.

On the home front—COLMONOY, applied to plow shares and farm implements, is helping keep food production up.

COLMONOY Hard Facing Alloys are valuable in every industry facing the problems of wear and corrosion. They are available in many different grades, with wide ranges in Rockwell hardness, and have effected tremendous economies when applied to oil well drilling and refining equipment, machine tools, agricultural implements, cement mill machinery, valves, chemical processing equipment, engine parts, and countless other parts subject to severe wear.

COLMONOY alloys are available in the form of paste, welding rods and castings.

Catalogs on Request

Describe all grades of COLMONOY Ferrous and Nickel base alloys, illustrate a wide variety of applications and include charts showing Rockwell C hardness, specific gravity, melting points and composition of all grades. Write today.

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Improve Production, Save Man-Power, Lower Production Costs

It's often a simple matter to powerize a hand operation with a Curtis Air Cylinder and not only increase production efficiency, but save labor, lower costs, and release men for other jobs, too.

Illustrated above is a Curtis Air Cylinder used to operate an oven door at the Buffalo plant of Curtiss-Wright Corporation— only one of hundreds of lifting, pulling, or pushing operations that can be handled by this equipment.

Curtis Air Cylinders have a record of unfailing service in many industries due to their rugged construction and simplicity of design; they are easily operated by women employes. Installation cost is small and power consumption low, using regular shop air lines. Because of their efficiency, negligible maintenance expense, and long life, important savings are almost inevitable wherever Curtis Air Operated Cylinders or Hoists are used.

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McGrath St. Paul precision instruments are outstanding examples of accuracy and fine workmanship. The engraving of the mechanically calibrated graduations (.0035" wide) is clean cut and easy to read. Only the finest aged high grade tool steel is used. The bases, scriber bars and working surfaces are hardened, ground and lapped to within 2½ millionths of an inch. Our height gages are tested and certified accurate by the country's leading gage laboratories.

Write on your business letterhead for the new McGrath St. Paul Precision Tool catalog, showing our complete line. Also our new patented, one hand operated, LEAD SCREW HEIGHT GAGE, which makes more accurate measurements in a fraction of the time.

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McGRATH ST. PAUL CO.
5th & Wacouta Streets, St. Paul 1, Minn.

McGrath St. Paul instruments are manufactured to optical precision, and are checked by laboratory methods at each stage of production.

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how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

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9345 Grinnell Ave., Detroit

KOEBELITE DIAMOND TOOLS

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LYNN Precision Self-Indexing Tool Post Turrets

for Lathes from 9" to 30" Swing

Both tee bolt and bolt circle mounting with special base for all types of screw machine and turret lathe mountings. 4 separate operations in succession with one set-up, re-indexing within 1/10 of 1,000. All working parts enclosed.

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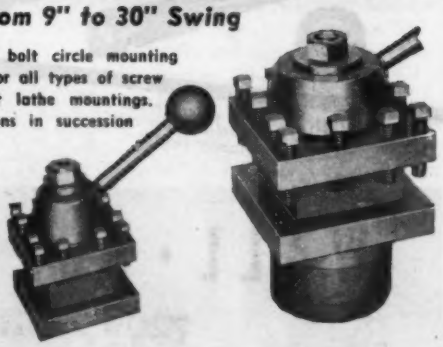

LYNN MFG. CO.
224 ELROY STREET
Minneapolis 5, Minn

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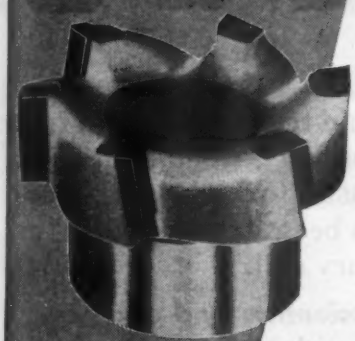
If you want proof of the time-saving and money-saving performance of Super Carbide Tipped Milling Cutters, look at the production records on jobs where these tools are at work. There you will find Super Milling Cutters setting new standards for speed, accuracy and quality of work. You'll find them saving production costs in many ways . . . increasing table feeds, running longer between grinds, reducing machine down time and providing much longer tool life than other types of milling cutters. For example:

On one job where aluminum castings were being milled, the high speed steel cutter formerly used ran at a speed of 600 RPM with a table feed of 5" per minute. This cutter ran four hours between grinds. When a Super 6-Tooth Carbide Tipped Cutter (such as shown at the left) was put on the job, the RPM's were stepped up to 1500, the table feed was increased to 20" per minute, and the Super Cutter ran one week between grinds. An additional saving was made because the Super Cutter ran dry while it was necessary to run the high speed steel cutter wet.



On another job where lugs on a diesel engine crankshaft were being faced off, a 4" Super Carbide Tipped Shell End Mill (such as shown at left) replaced a high speed steel cutter with the following results: RPM's were stepped up from 90 to 545. Table feed was increased from 1⅛" per minute to 12½" per minute. And crankshafts per grind were increased from 4 to 25. On this job the length of the cut was 6", the depth 3/16" and the width 1½". Additional savings were made because the Super Cutter ran dry while the HSS cutter ran wet.

You, too, can get savings like these! Just specify Super Carbide Tipped Cutters on your milling jobs!

WRITE TODAY FOR THIS LITERATURE

Descriptions, illustrations, prices and complete details of Super Carbide Tipped Tools for turning, facing, reaming, spot-facing, forming, grinder rests, wear parts, boring, drilling, grooving, counterboring, shaving, centers and special purposes are given in a series of folders. One or all of these folders will be sent to you upon request. Write today.

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Carbide Tipped Tools

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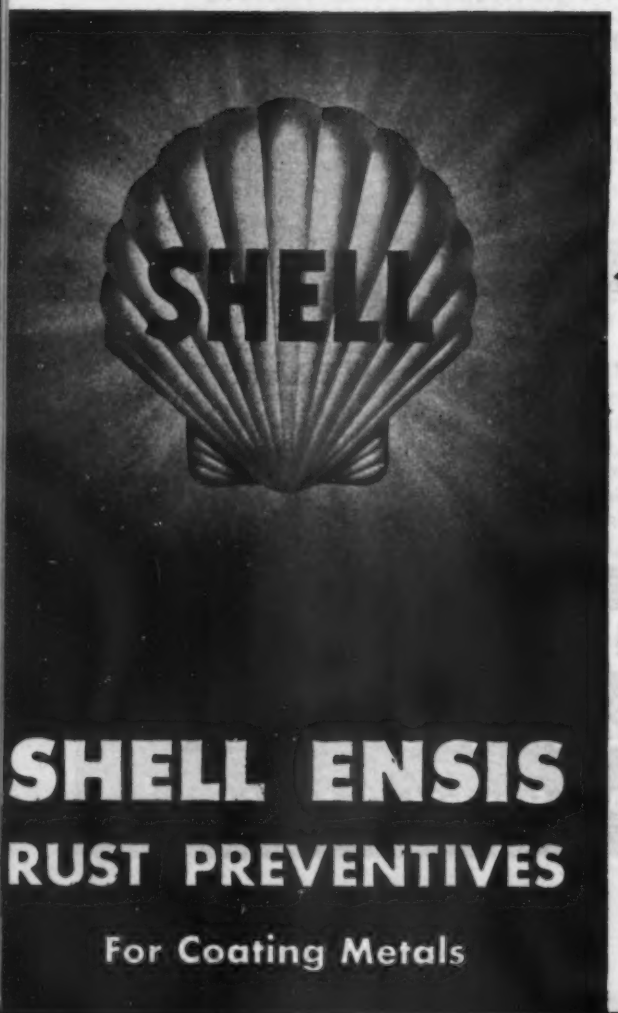

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For Coating Metals

FOR YEARS AMERICAN INDUSTRY has paid tribute to demon rust to the tune of $1,000,000,000 a year. Rusting of lubricated surfaces has been "put up with" as a necessary evil.

Shell scientists and engineers, working with steam turbine manufacturers, did the "impossible"... developed a rust-preventive turbine oil.

Using the wealth of knowledge gained by developing and perfecting this oil, Shell's Research Laboratories then focused their efforts on developing a similar line of rust-preventive oils for general industrial purposes. The result is the new Shell Tellus Oils for machine lubrication and the new Shell Ensis Rust Preventives for coating metals.

The new Shell Tellus Oils are not designed to *remove* rust. They will not eliminate all existing rusting conditions that may be present in your machines. But where moisture is a factor, the new Shell Tellus Oils, because of the special rust-inhibiting qualities built into them, afford unequaled protection against the formation of rust ... and without the sacrifice of other valuable

# of industrial products to RUST!

characteristics. They form a protective film that coats the metal, making it highly resistant to water and moisture. Shell Tellus Oils also have superior oxidation stability.

The new Shell Ensis Rust Preventives cover a complete line of oils, coatings and compounds. They are available in a number of grades, designed to give protection against the dangers of exposure, which range from the extreme effects of rain and snow during outdoor storage, to the mild humidity conditions encountered in the factory between machining operations. The protective coatings formed by Shell Ensis Rust Preventives graduate from the extremely thin, transparent oil films that need not be removed, to the heavy, abrasion-resistant coatings which will withstand severe weathering conditions over long periods of time.

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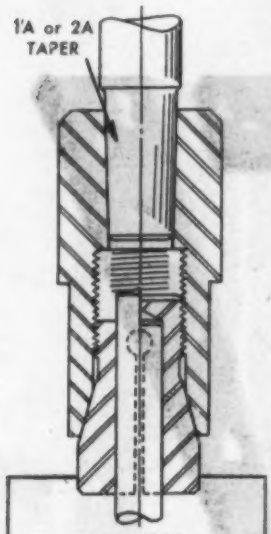
Drawings are actual size



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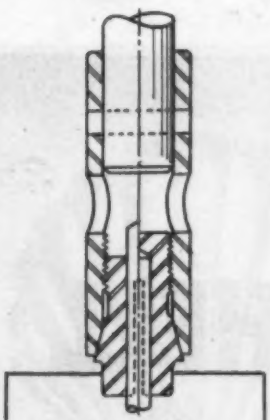

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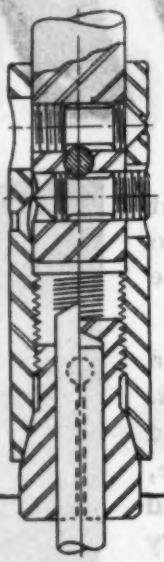

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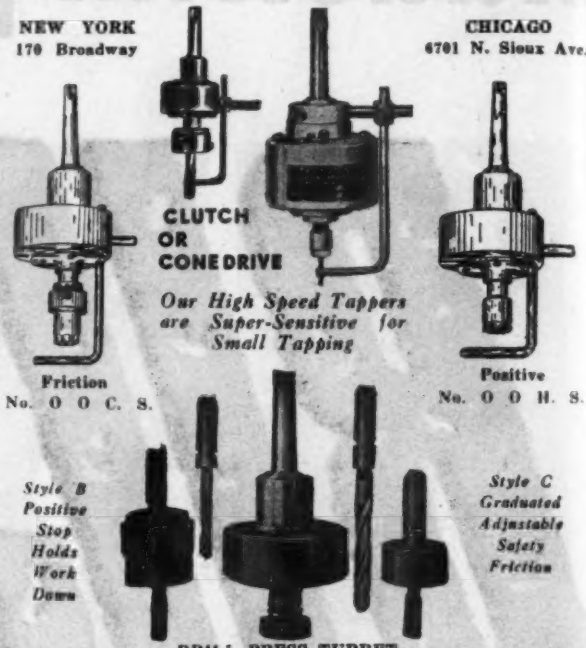

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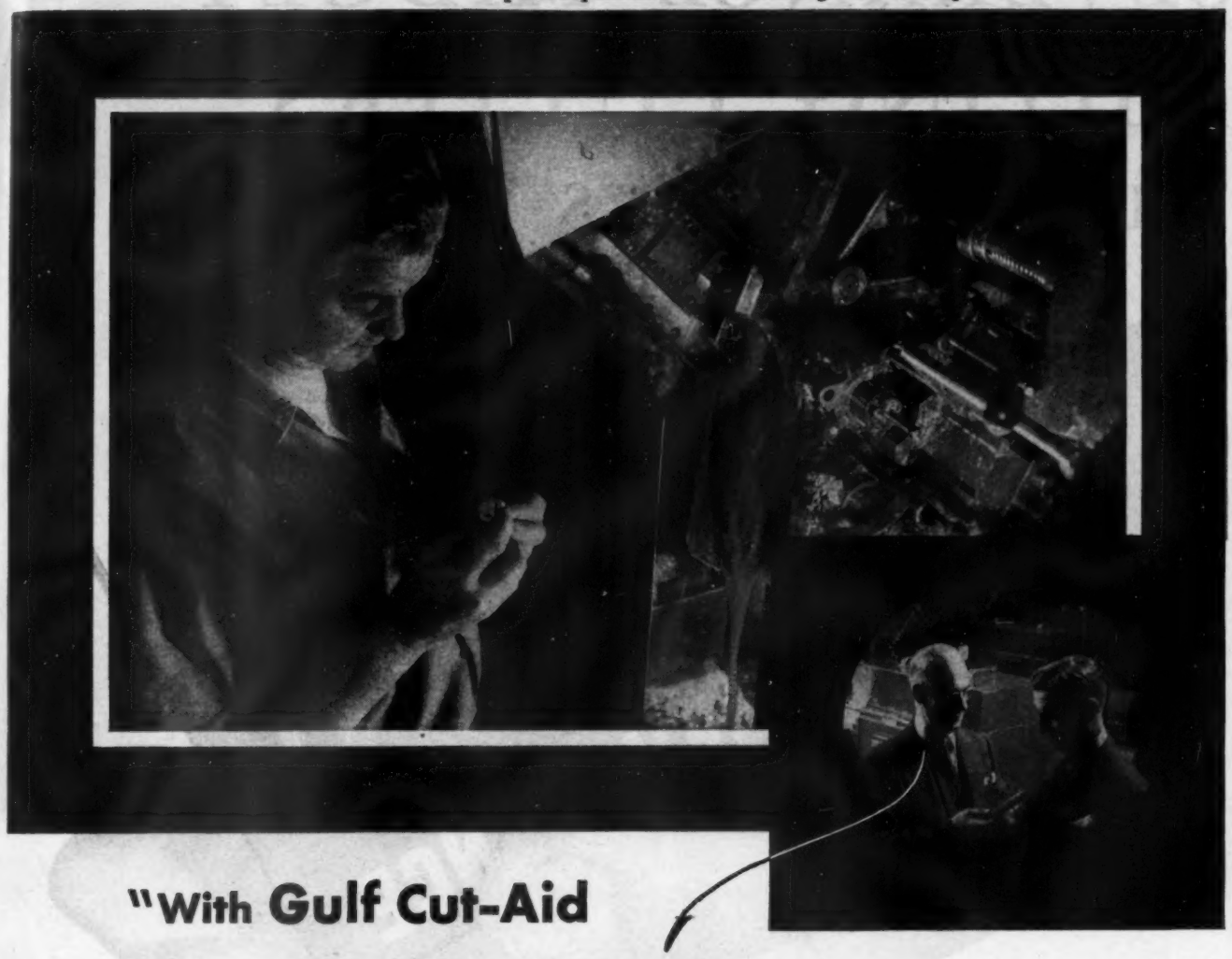
The big battery of modern screw machines in this plant produces several different types of aluminum aircraft parts with the help of Gulf Cut-Aid. In the lower photo a Gulf Service Engineer (right) is shown consulting with the plant Superintendent on machining aluminum caps.



"With Gulf Cut-Aid we increased aluminum cap production 25% —— tool life over 100%"

says this Superintendent

GULF CUT-AID does a better job on aluminum than any other cutting fluid we've ever used," says this Superintendent. "With this outstanding new cutting oil we stepped up production of aluminum caps 25%, increased tool life well over 100%, and are getting better threads."

Gulf Cut-Aid consistently shows better results in cutting aluminum and other nonferrous metals!

In addition to its superior performance on this class of work, Gulf Cut-Aid has another important function—it's an effective energizer for other cutting oils, regardless of type or viscosity. When blended in the proper proportion with other cutting oils, depending upon job requirements, the use of Gulf Cut-Aid makes possible higher production speeds and results in improved finish, longer tool life, or both.

Call in a Gulf Service Engineer today and let him show you how Gulf Cut-Aid and other Gulf quality cutting oils can help you with your production problems. Write, wire, or phone your nearest Gulf office.

GULF INDUSTRIAL LUBRICATION

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SEVERANCE MIDGET MILLING CUTTERS

WITH ⅛" SHANKS

Available singly or in sets of 10 shapes

For extremely fine work with portable power tools . . .

Now to the standard line of Severance cutting tools has been added Midget Milling Cutters with ⅛" shanks for especially fine precision work. These efficient, long-wearing, quick-cutting little tools have all the qualities of their big brothers in the Severance line. They cut sharp chips into the toughest metal, wood or plastic without chatter. They do a top-notch job of finishing on the most intricate patterns or parts. Available in ten standard shapes, singly or in sets of ten in an attractive, handy, colorful box that keeps them in neat order at all times.

If your production calls for fine finishing of small parts or hard-to-get-at surfaces, you will find the new Severance Cutters with ⅛ inch shanks the ideal tools. Order a trial set for immediate delivery.

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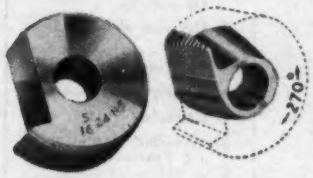
This Micrometer Grinding Gauge determines the proper amount of grind for Namco Circular Chasers, and then checks the accuracy of the Chasers after the grind.

Long runs of Class 3 threads start with precision—and precision is maintained throughout the run, because Chasers are reground on blocks that support them, and returned to head to cut identical threads without adjustments or variation.



Namco Self-opening Dies with Circular Ground Thread Chasers Cut Production Costs because

- . . . Chasers may be ground through 270° circumference
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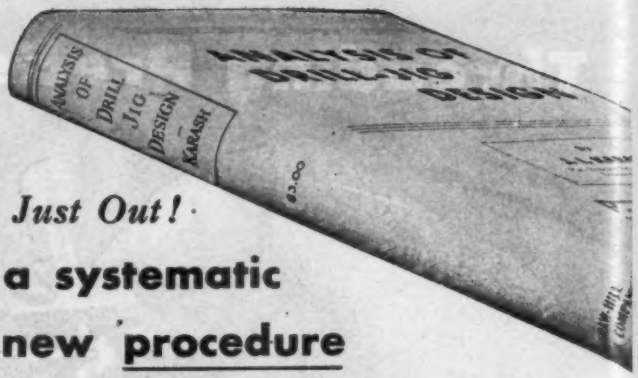

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A systematic procedure of tool design that makes easier and more productive the mental steps in producing the best tool for the job.

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2. Gathering Information
3. Analysis of Drilling Operations
4. Division-of-work Decision
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6. Principles of Locating
7. Clamping
8. Secondary-operation Jig Features
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—meet shop and production requirements most completely

—gather the information necessary in making decisions

—make the decisions required by shop and job factors, by the main and secondary operations to be performed, by locating, positioning, clamping, and ship-clearance problems, etc.

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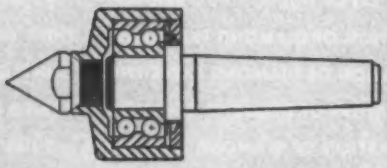

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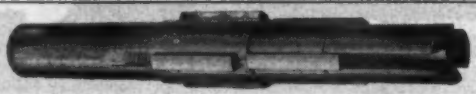

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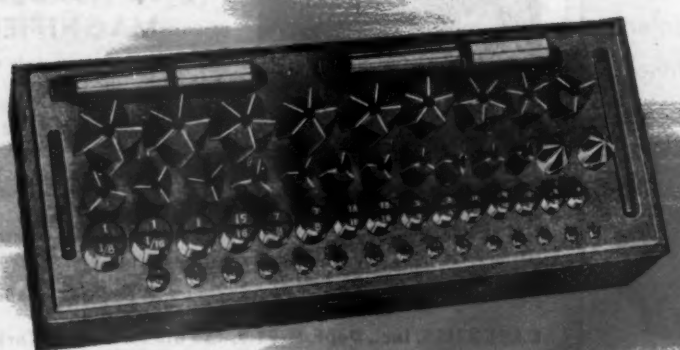

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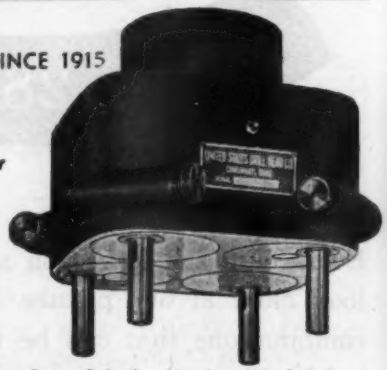

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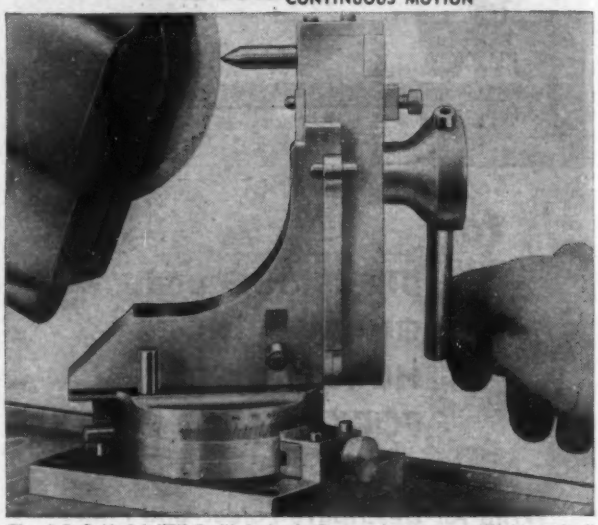

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HELICAL
TAPER PIN
REAMERS

Scientifically made of selected steel under modern processes. Long lived, economical, accurate. Details on request.

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Made by us for 23 years and still made by us only.

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Tool life greatly increased by reconditioning cutting oil *with* BARRETT OIL EXTRACTION SYSTEMS

Reports from plants using Barrett Oil Recovery and Reconditioning Systems show surprisingly high percentages in increased tool life. Then, too, users are enthusiastic as to the improved condition of the reclaimed oil as well as the high returns on the investment. Some set-ups in plants engaged on defense production have paid for themselves in a few months.

The Barrett Centrifugal Oil Extractor—which is part of a complete system—recovers 100% of the removable oil or 98½% of the contained oil from chips and turnings in 2 minutes or less. Complete Barrett oil recovery and reconditioning systems include Extraction, Sterilization and Sedimentation, together with filtration. The units involved are available in various sizes, individually or as a group, and are available with full manual control, semi-automatic control or with full automatic control requiring only loading, unloading, starting and stopping of the extractor by the operator. Complete plans including storage tanks for reclaimed oil or for use in conjunction with existing equipment are also available.

With the Barrett system, abrasive-free oil assuring longer tool life can always be depended on. With Barrett Sterilization and Sedimentation equipment, cutting oil is also safe and free from contamination.

Investigate Today by Sending for Descriptive Bulletin of Oil Recovery and Reconditioning Systems

Barrett Centrifugal Oil Extractor—the heart of Barrett Cutting Oil Recovery and Reconditioning Systems.

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

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Dust and Grit are easy prey for the AIR MASTER. Once installed on a grinder or buffer, the AIR MASTER sucks the dust and grit right off the whirling wheels. No longer do you have to worry about flying dust and grit injuring the lungs of your employees and causing breakdowns of expensive machinery by getting into sensitive moving parts.

AIR MASTER eats 'em alive and digests them thoroughly, leaving the air about your grinders and buffers free from these deadly destroyers of health and machinery.

The AIR MASTER is fully self-contained . . . efficient, rugged, dependable. A size for every grinder or buffer. Write today for full details.

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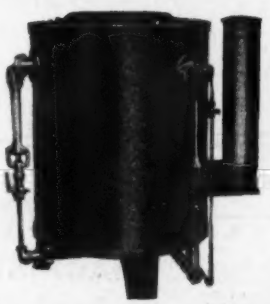
2400 F.°

Attained quickly with "Buzzer" Full Muffle Furnaces designed primarily for heat treating high carbon and alloy steels.

NO BLOWER or POWER NECESSARY . . . just connect to gas supply



"BUZZER" Atmospheric Pot Hardening Furnaces assure even heat up to 1650° F.

Used for Salt, Cyanide and Lead Hardening. Also adapted for Melting Aluminum.

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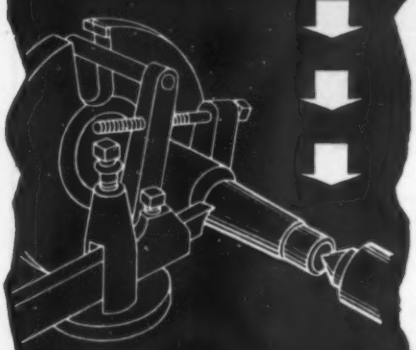

on the DEAD CENTER

DIXON'S LATHE CENTER GRAPHITE LUBRICANT... combines lubricating flake graphite with an extreme pressure lubricating compound. It possesses almost super-film strength. As a result of these advantages, it reduces the chances for overheating, reduces wearing or scoring of dead centers, steady and follower rests and jack screws.

Assures more accurate work.

JOSEPH DIXON CRUCIBLE CO., JERSEY CITY 3, N. J.
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Pipe Joint Compound · Graphite Seal · Graphited Oils
Cup and Pressure Gun Grease · SlipStik
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No. 1 to 60
New High Speed
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No. by Gage	Length	Our Price Net Each
1 to 10	6¼	$ .75
11 to 20	5¾	.75
21 to 30	5⅜	.75
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41 to 50	4½	.75
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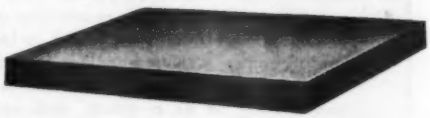
If you buy 60 drills or more — 20% discount

VICTOR MACHINERY EXCHANGE INC.
251 CENTER STREET
NEW YORK N. Y.

BE ACCURATE

Accuracy wins wars—on the battle front and on production front. Promote positive precision with Challenge equipment!

USE CHALLENGE



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These plates provide an accurate surface for assembly, layout and inspection, and tool room operations — particularly on small parts. Made of special analysis semi-steel with all sides machined at right angles to the top. Two, four, and six inches thick. Standard sizes in the two-inch plates range from 8x10 up to 36x84 inches. Four-inch plates from 12x12 to 48x72 inches; six-inch, from 12x12 to 54x144 inches. Either precision ground (up to 36x96-in.) or planer finish. Special and larger sizes to order.

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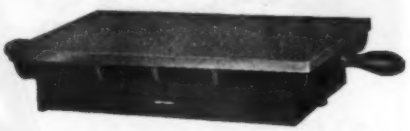
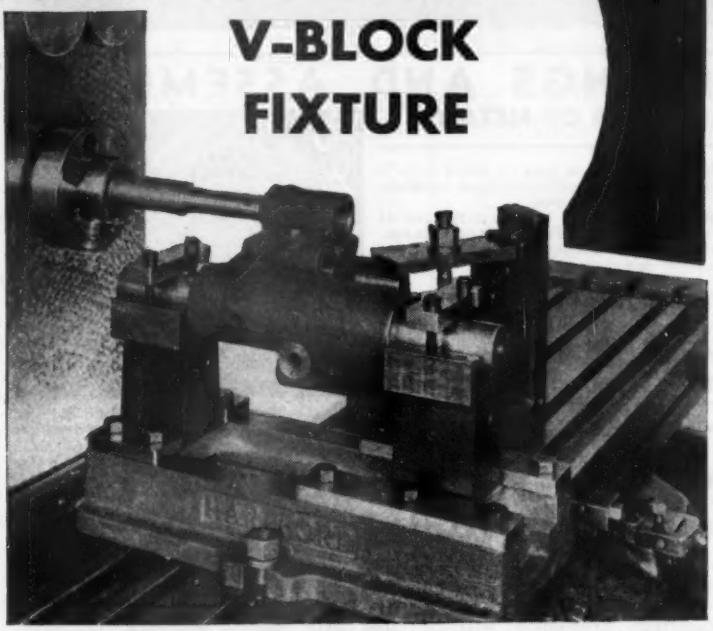


Provide a true surface for tool making, inspection, and testing purposes, also reliable master plates. Challenge Surface Plates are made of strong, close-grained semi-steel, specially heat-treated. They have three-point suspension and heavy, deep ribs on the underside which form triangular supports for the top surface. Will not give or sag under load. Furnished either hand-scraped or precision ground. Felt-lined wooden protective cover supplied with each plate.

BUY WAR BONDS
THE CHALLENGE MACH'Y CO.
Main Office and Factory: GRAND HAVEN, MICH. • Eastern Sales Office: 50 Church St., NEW YORK

The "HARTFORD" V-BLOCK FIXTURE



. . . for time savings on MILLING, BORING and INSPECTION SET-UPS

Better work is assured as well as faster set-up of irregular pieces through the use of this new "HARTFORD" contribution.

In the application shown here, the V-Block Fixture is used for holding an irregular casting during a precision boring operation on a milling machine. Speed and simplicity of set-up are obvious from the fact that after the first hole is bored or drilled, the other holes are bored accurately parallel and in true relationship to the arbor. The set-up remains the same for all these operations.

The HARTFORD V-BLOCK FIXTURE consists of a semi-steel, accurately machined and scraped base. Cross Keyways and ample clamping facilities are provided for secure holding to machine table. Clamps for positioning V-blocks in base facilitate adjustment of blocks. In addition, hardened and accurately ground V-blocks and clamps are furnished for holding test bars or arbors in place.

Send for bulletin showing the HARTFORD V-Block Fixture as applied also to milling, drilling and inspecting.

THE HARTFORD SPECIAL MACHINERY COMPANY
HARTFORD CONNECTICUT

HOBART
"Simplified" arc welders
HOBART BROTHERS COMPANY, BOX A.M. 9-14 TROY, OHIO
CATALOG FREE!

Write for Bulletin

STEVENS MILLING MACHINE VISES
5 in., 6 in. and 7 in. sizes
All parts Interchangeable
JOHN B. STEVENS INC.
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LEADING THE INDUSTRY IN CARBIDE TOOLS SINCE 1930
Vascoloy RAMET
TANTUNG CUTTING TOOLS — DIES
VASCOLOY RAMET CORP. • NORTH CHICAGO, ILLINOIS

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CARBIDE TIPPED GAGES AND TOOLS
Consistent Quality
ARTHUR A. CRAFTS COMPANY, INC.
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IMPROVED TYPE HOLDERS
for stamping into metal, etc.

Hand or Press style. Type can be easily, quickly loaded and unloaded. Simplest construction. Just a sturdy pin holds the type securely. No screws nor springs. Super-quality steel type made in various sizes: 1/32" up to ½" figures and letters.

STEEL TYPE

Write for Bulletin AM23H

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CONTRACT WORK

PLANT EMPLOYING 200 PEOPLE HAS PRODUCTION TIME OPEN

- CENTERLESS
- TURRETS
- MILLERS
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Over 200 Machine Tools

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STAMPINGS AND ASSEMBLIES
IN ALL KINDS OF METALS

Fast and efficient service on long or short runs is guaranteed by our modern equipment and methods, backed by 50 years of experience.
We also offer facilities for the manufacture of screw machine products, tools, dies, jigs and fixtures.
Quality work by skilled mechanics is assured. Send your blueprints or samples today.

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PERMANENT MAGNETS
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THOMAS & SKINNER
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Designers and builders of wire and ribbon stock forming machines.

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HAMMERED FORGINGS

Gear Blanks, die blocks, crankshafts, forged weldless rings, spindles, forgings of any shape or size.

Forgings machined and/or heat treated. Immediate deliveries.

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Lathe, Mill, External and Internal Grinding, and Drill Press Equipment. Tool shop work or precision production. Low time rate or job estimates.

Old, Established Firm, started during last war

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Dept. AM, DAYTON 2, OHIO

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FREEPORT MACHINE WORKS, INC.
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These advertisers invite you to consider their facilities, when placing contracts for work they are especially equipped to do. If you respond to their advertising, please tell them you saw it in

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Specialists in grinding Circular and Flat FORM-TOOLS, FORM Counterbores, FORM Flat-Drills, and related types of FORM grinding. Also step-grinding of Tungsten and Molybdenum Rods.

Send Prints for Quotation and Delivery

J. & S. TOOL CO.—477 Main St.—E. Orange 1, N. J.
(Makers of J.&S. Radii & Angle Dressing Tools)

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WIRE AND METAL SPECIALISTS
In round, flat, square and special shaped wire in all metals.
LARGE PRODUCTION CAPACITY
Plating and finishing.
EASTERN TOOL & MFG. CO.
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LET US REBUILD AND MODERNIZE YOUR MACHINE TOOLS

Our Methods of Rebuilding are similar to the Methods used by Manufacturers of New Machine Tools. Each Machine is Disassembled—Castings—Replaned — Hand-scraped — Spindles Reground and Bearings Refitted. All Worn-out Parts Replaced — including gears — Re-Lined and Machines Run in and Tested under Load.

We therefore are in a position to guarantee accuracy for our Rebuilt Machines to be Similar to new Machines.

We will design and build your Jigs and Fixtures.

VOLYN MACHINE TOOL WORKS, Inc.
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PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us – we will take care of them
GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

POSITIONS VACANT

WANTED: Mechanical Engineer with experience in welding design, to work in engineering and sales promotion. Splendid opportunity for the right man. Address P. O. Box 247, Middletown, Ohio, and state qualifications and salary expected.

MACHINE SHOP foreman. 30 to 40 men on planers, shapers, milling machines and lathes. Small town in Va. Permanent. Give fully age, experience, references, salary expected. P-925, Amer. Mach., 520 N. Michigan Ave., Chicago 11

PRODUCT ENGINEERS. Knowledge aluminum and steel welding, assembly sheet metal products, tool and product design, jigs and fixtures. Small town in Va. Permanent. Give full age, experience, references, salary expected. P-926, Amer. Mach., 520 N. Michigan Ave., Chicago 11

JUNIOR ENGINEERS—Draftsmen. Able to complete, clear, and accurate drawings and handle trouble shooting on tools, jigs and fixtures for sheets metal production. Small town in Va. Permanent. Give fully age, experience, references, salary expected. P-927, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

EMPLOYMENT SERVICE

SALARIED POSITIONS—This advertising service of 34 years' recognized standing negotiates for high salaried supervisory, technical and executive positions. Procedure will be individualized to your personal requirements and will not conflict with Manpower Commission. Retaining fee protected by refund provision. Identity covered and present position protected. Send for details, R. W. Bixby, Inc., 266 Delaware Bldg., Buffalo 2, N. Y.

POSITIONS WANTED

MANUFACTURING EXECUTIVE desires new connection as chief engineer or production engineer. Seasoned executive qualified to develop and produce new products. Technically trained mechanical and metallurgical engineer. 47 years of age. 25 years practical experience. 16 years in responsible charge. Thoroughly familiar with modern production methods machine shop or foundry. Competent to supervise all details. Excellent references. Will travel anywhere. PW-910, Amer. Machinist, 330 W. 42 St., N. Y. 18, N. Y.

EXPORT EXECUTIVE. Over twenty years experience in every phase of export in the U. S. and abroad. Excellent record of accomplishment, fluent in the principal commercial languages, widely traveled, thoroughly competent and reliable. P-928, American Machinist, 330 W. 42nd St., New York 18, N. Y.

ENGINEER presently employed seeking change with post-war future. Thirty-two years experience on machine tool manufacturing; tool, die, machine and adding machine designing. Toolroom, maintenance and production supervision. Production, process and methods engineering. Chief estimator on ferrous and nonferrous metal stampings and finishing. Some experience welding and forgings. Age forty-eight. Excellent health. PW-929, American Machinist, 520 N. Michigan Ave., Chicago 11.

TOOL AND production engineer; carbide specialist, organize and install tool control systems. Experience covers, plant layout, tool design, supervisor, production methods planning, estimating and purchasing. Connection with firm having post-war program desired. PW-930, Amer. Machinist, 330 W. 42 St., N. Y. 18, N. Y.

EXECUTIVE 35 years experience — qualified to supervise tool design. Tool room and production as superintendent or assistant to chief executive. First class organizer and systemizer. 12 years with present employer. Desire permanent connection, in a smaller city. Address—A. R. E., 5544 Underwood, Detroit 4, Mich.

SALES ENGINEERS TO INDUSTRY

DO YOU NEED sales engineers in the western New York, Pennsylvania and Ohio area? We, as an associate group of engineers embracing all technical fields, now offer our services as sales engineers to industry. The proper application of our resources and talents should bring about greater sales to more satisfied customers.

Manufacturers desiring representation in this area are invited to write for full information.

RA-920, AMERICAN MACHINIST
330 W. 42nd St., New York 18, N. Y.

PRODUCTION ENGINEER

For well established, well equipped plant with young, progressive management and good post war setup. Product: Tools, such as wrenches, pliers, etc.

Must be thoroughly trained and have practical experience in jig and die design, plant layout, production control, time study, etc.

Located in city of 10,000 population, 75 miles from Minneapolis.

Permanent connection for right party—Write

OWATONNA TOOL COMPANY
OWATONNA, MINNESOTA

WANTED

Executive Engineer

Outstanding opening for mechanical engineer — technical school graduate preferred — experienced in design of special and heavy machinery, management of engineering department and supervision of design work of others. Age range 30-50.

Exceptional opportunity, for advancement with leader in growing industry — well established organization — more than 50-years standing.

Location — Cleveland.

P-933, AMERICAN MACHINIST
520 North Michigan Avenue **Chicago 11, Ill.**

WANTED

Tool Designer-Mechanical Draftsman

A large and old established Chicago Company located on the West Side has an opening for a tool designing engineer with practical mechanical experience in dies, jigs, and fixtures. Must be able once the new product has passed the experimental stages to design and decide what tools are needed for mass production in order to produce the product at minimum cost, capable of following the tools through the plant to see that tools are working properly when processing the parts. Please give age, nationality, previous experience, companies worked with and salary expected. Present employers will not be approached.

P-935, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

Additional Employment and Business Opportunity Advertising on Page 346

POSITION VACANT

Experienced Mechanical Engineer

Engineer wanted with wide experience in designing and developing light machinery. To be considered applicants must have had wide experience in Engineering and Development work and must be competent to direct and supervise all details.

An exceptional opportunity to become connected with a highly successful firm outstanding in its field; modern plant, up-to-date methods, and located in a large northeastern seaboard city, with attractive nearby suburbs, good homes and surroundings.

For consideration state in detail present position, past experience, education, age, and salary desired. Interview will be arranged; all correspondence will be considered strictly confidential.

P-908, American Machinist
330 West 42nd St., N. Y. 18, N. Y.

REPRESENTATIVE AVAILABLE

(Continued from page 345)

SALES REPRESENTATIVE desires lines for Detroit, Michigan territory. Machinery, tools or factory equipment. Nine years technical sales in Detroit area. Ten years manufacturing experience. College training in industrial engineering. RA-931, American Machinist, 330 W. 42nd St., New York 18, N. Y.

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PRESIDENTS, EXECUTIVES, superintendents, managers, — increase your night shift's production, without any cost to yourself. Request "proof." It tells how. It's free. No obligation, of course. Raymond Dow, 17 Park Row (1216B).

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PATENTED SINGLE action one operation drawing and trimming dies for deep or regular cylindrical, rectangular, irregular shape sheels (articles) on reasonable license shop-right. Burnett Menkin, 1930 Anthony Ave., Bronx, New York 57, N. Y.

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MANUFACTURING FACILITIES WANTED: Forging, cold-heading or punch press shop wanted to make several million pocket knife holsters for us. Write for samples. Union Cutlery Co., Inc., Olean, New York.

WANTED

SALES ENGINEER

Location — Ohio

Progressive engineering and tool manufacturing concern of twenty-five years standing is seeking a qualified tool designer who is, by virtue of experience, capable of heading up engineering sales, covering complete service in tool design, process engineering, production planning, plant lay-out, etc. We have an engineering organization of approximately sixty men and our manufacturing facilities are balanced in a manner to permit the handling of all types of work. This combination enables us to manufacture all tools and equipment which we design. If customer so desires. This is a first-class job for a high caliber man and offers unlimited post-war possibilities. Straight salary, or salary and commission. Give complete chronological record and all pertinent facts in your letter.

SW-932, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

TWIST DRILLS

Supervisor Midwest Sales territory working with Manufacturers Agents. Willing to travel. Must have detailed knowledge of drills and high grade character references. Good salary plus participation.

ACE DRILL CORPORATION
DETROIT 27 MICHIGAN

ATTENTION

OUT OF THE ARMY LOOKING FOR POST WAR MANUFACTURER TO BUILD SMALL FAST SELLING PRINTING PRESS, COMPLETE OR PARTS. HAVE COMPLETE DRAWINGS AND PATTERNS.

JOHN B. WEBENDORFER
111 E. Grand St., Mt. Vernon, N. Y.

HELP WANTED

Old established plant, manufacturing mechanical-electrical product. Employ 500. Location Brooklyn, N. Y. Technical and supervisory positions open through reorganization. Good post-war possibilities.

CHIEF PRODUCTION ENGINEER—M. E.—Responsible for production, plant layout, tool and gage designing, time study, etc.

MANUFACTURING SUPERINTENDENT—Experienced, supervise, plan and execute all manufacturing operation. Train and supervise personnel.

ASST. PRODUCTION MANAGER—Responsible for stores, shipping, receiving, material handling, ordering of material. Requires good organizer.

PURCHASING AGENT—Experienced—good executive. Responsible for purchase of all materials. Thorough knowledge of government regulations.

DESIGN ENGINEER—E. E.—Design mechanical and electrical parts for automotive field.

RESEARCH ENGINEER—E. E.—Some experience in magnetic circuits, electrical coil construction. To perform research and development in electrical ignition for automotive field.

Also require Foremen and Assistant Foremen in Manufacturing, Draftsmen, Operations Sheet Writer. Release required.

P-936, AMERICAN MACHINIST
330 WEST 42nd STREET NEW YORK 18, N. Y.

SUPERINTENDENT WANTED

By old established Wisconsin manufacturer employing 150 people. Must have broad experience in building medium heavy machine tools. Ability to organize all phases of production essential. Give full details including salary expected in first letter.

P-934, AMERICAN MACHINIST
520 North Michigan Ave., Chicago 11, Ill.

A PROVEN PRODUCT

Will sell, or license to manufacture and market, a patented Special Woodworking Machine, which is completely engineered for quantity production, including match plate patterns, jigs, and fixtures. This machine is in demand by Building Contractors, Lumber Yards and Industries fabricating lumber. It is a proven product which is now being successfully manufactured and marketed, with unlimited Post War Sales. Address

BO-922, AMERICAN MACHINIST
520 N. Michigan Ave., Chicago 11, Ill.

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Coulter Diamond Boring Machine

Vertical, single spindle, complete with 5 HP, 440 volt, 3 phase drive with starter and work held down—can finish bore holes up to 4" dia. by 3" deep. Machine ready to run.

THE OHIO ELECTRIC MFG. COMPANY
CLEVELAND, OHIO

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VERTICAL SPINDLE SURFACE GRINDER, 18" TO 22" WHEEL, APPROX. 90" TABLE TRAVEL.

W-924, American Machinist
330 WEST 42nd STREET
NEW YORK 18, N. Y.

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Additional tool lines, especially cutting tools or gages. For lower Ohio, Indiana, and Kentucky.

BLACKKETTER EQUIPMENT CO.
3900 Reading Rd. Cincinnati 29, Ohio

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STRAIGHT SIDE TRIMMING PRESS

Flywheel type, 6" stroke 20" x 20" die space, capacity approximately 100 tons, needed for urgent war work. Detailed quotations with picture, if possible.

W-923, AMERICAN MACHINIST
330 W. 42nd St. New York 18, N. Y.

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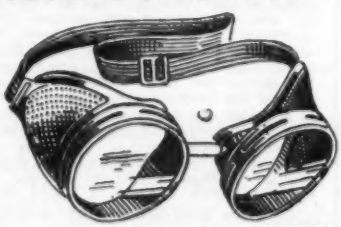
INDUSTRIAL CLEAR LIGHT GOGGLES



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And Other Well-Known Makes

USED GOGGLES
Reconditioned, Good as New, Values to $1.75

49¢ PR

100 OR MORE, Pr. 40c

NEW Clear Light GOGGLES
"Willson" or "Duralite," 50mm Lens, $1.75 Value

Each **$1.00** 100 or more 85c pr.

CLEAR LIGHT LENS, Pr. 25c COLORED LENS, Pr. 50c

Mail Orders Promptly Filled, Send Check With Order

1610 READING RD. **LIQUIDATORS SALES CO.** CINCINNATI 2, OHIO

"FALK" for DEPENDABILITY in Rebuilt Machinery

OUR INVESTMENT IS YOUR SECURITY

"FALK" STOCK — A modern stock, with every item owned by "FALK" and in our warehouse or enroute. Shipments can be scheduled because "FALK" owns the machines. "FALK" critical inspection is given to every stock item. —Your inspection is welcome under ideal conditions for selecting machine tools.

"FALK" FACILITIES — Modern facilities to operate, rebuild and inspect used machine tools are provided to assure successful operation. Experienced personnel under supervisors with years of experience in our organization.

GOOD BUYS FOR THE MODERN SHOP* — IMMEDIATE DELIVERY

SHEARS

American 12' x 5/16.

PRESSES

#4 Bliss D.C. B.G. Forging 4" stroke.
#4½ Bliss D.C. B.G. Forging 4" stroke (2).
#4½ Bliss 3 column B.G. 3" stroke
#5 Bliss D.C. B.G. Forging 3" stroke.
#74½ Bliss S.S. geared.

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100" Niles-Bement-Pond Bor. & Turn. Mill
Vertical, 48" Gisholt.
Vertical, 52" and 60" Colburn.
Horiz. #36 Landis-Rochester, 3½ Bar Floor Type—Floor Plate 72" x 120".

DRILLING MACHINES

Weigel 22" backgeared, sliding head, tapping attachment, power feed.
Superior 26" backgeared, sliding head, tapping attachment, power feed.
Avey, 2 & 3 spindle Prentice, 4 spindle.
Henry & Wright, 6 spindle.

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5' Arm 11" Rd. Col. Cincinnati Bickford.
5' Arm 13" Rd. Col. Cinn. Bick. air clamp.
7' Arm 13" Col. Cincinnati Bickford
4'11" Col. Cincinnati Bickford

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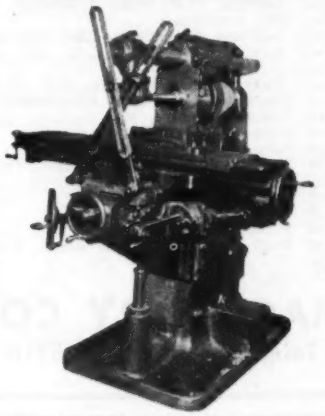
Fox #15H 54 spindle hydraulic feed.
Fox #D-31 24 spindle motor drive.
Natco #D-5 8 spindle #1 M.T.
Boley Multiple adj. spd. ¼" cap. ar. M.D. —Arr. 10 spindles, equipped with 6

GRINDERS

16" Heald Rotary Surface Grinder.
12" Persons-Arter Rotary Surface Grinder.
12" Heald Rotary Surface Grinder equip with 9" Dia. Perm. Mag. chuck.
#2 Cincinnati Centerless Grinder, Filmatic.
#12 Greenfield Internal Hydromatic Grinder, sizematic type, complete with Tank and Pump.
Oliver Model 51 Drill Grinder; 1½" cap.
Pratt & Whitney 14x36 model B vert. sur. grinder.

MILLING MACHINES



#2 Brown & Sharpe Plain Milling Machine. Range—28 Longitudinal travel. 10" cross travel. 19" Vertical travel. Table working surface 10" x 45".
No. 5 Cincinnati, High Power, Plain, S.P.D.
No. 4 Cincinnati, High Power, Plain, S.P.D.
No. 3 Cincinnati, High Power, Vertical.
No. 2 Cincinnati, High Power, Plain.
No. 2 Cincinnati, Motorized, Pyramid Col.
No. 2 Brown & Sharpe, Plain (10).
No. 1½ Brown & Sharpe, Plain (2)
#1 Kempsmith Universal, Cone Drive.
#2 Brown & Sharpe vert., single pulley dr.
No. 1½ Valley City Universal, Cone Dr.
No. 1 Brown & Sharpe, Plain (6).
No. 12 P & W Lincoln Type Production (2).
No. 0 Bickett Vertical Bench Miller.
Ames Precision Universal Bench Mill.
P & W 2" Duplex Spline Miller.
Hall Planetary Thread Miller 24"
No. 8 Lees Bradner Thread Miller.

PLANERS

120"x72"x35' Betts, 4 Heads, M.D.*
72"x72"x18' Pond Heavy Pattern, 4 Heads.
48"x48"x12' Putnam Heavy, 2 Heads, M.D.
30"x30"x12' American M.D., 2 Heads.
30"x30"x10' Cinn. Heavy Pattern, 2 Hds.
20"x20"x36" Niles-Bement-Pond, Planer Shaper, M.D.

LATHES

South Bend 16" x 6' Motorized Gap Lathe
Putnam 26 x 12 Heavy QCG, arr. for M.D
American, 16 x 6 Q.C.G.
Hendey, 16 x 10 Q.C.G., Turner M.D.
American 16 x 6.
Potter & Johnston #6A Automatic, 3½' dia. hole in 5¾" Spindle. (2).

SHAPERS AND GEAR CUTTERS

14" Steptoe, M.D.
16" Queen City, M.D.
7" Rhodes Horiz. High Speed, Belt Dr.
26" Cincinnati Triple Geared Belt Dr
#612 Fellows 36" Gear Shapers, (2)
12" Schuchart & Schutte Gear Hobber.
2 — #3 Barber Coleman Gear Hobbers Serial Nos. 111 and 579.

BENDING ROLLS

Bertsch 3" x 3" x ⅜" angle bending roll.
Niagra pinch type 7" roll motor driven.

MISCELLANEOUS

Lakewood High Lift Truck, platform type 4000# capacity, less batteries.
J. C. Miller Co. Lacq. Heater with acquistat
Heat Treating Furnaces for the tool room all sizes.
Sleeper & Hartley #1 Wire coiling machine for making BX cable.
50 K.W. Moesta Gun Welder Transformer, portable, 25 cy. 440 volts.
Grinding Wheels for #2 centerless 4" face 20" diameter.
Blake and Knowles 12x2x12 Simplex Type Hydraulic Steam Pump, 2000 lbs. pressure with 8 to 125 lbs. steam, delivers 9 gallons per minute.
Niagara #98 Brake & Folder, 72 cap. 14 ga arranged M.D.
#228C Greenlee Vert. Hollow Chisel Mortiser, Power feed, M.D.

HEADQUARTERS FOR POWER PRESSES

The above list, selected from our current stock, is subject to prior sale or subsequent additions. Hence we urge your prompt inquiries on any of these machine tools or others in which you are interested.

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54" Cincinnati Hypro, Vert. Used 3 months
24" Bullard Vert.
4" Bickford, S.P.D. Horiz.
3" Betts Horiz.

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3A Carlton 5'-17" Col. New 1941. Slightly used.
6' Cincinnati Bickford
5' Foadick M.D.
4' Cannedy-Otto
4' Cincinnati-Bickford M.D.
4' Dreses
3½' Niles M.D.
#25 Foot Burie, H.D. S.P.
24" Cincinnati Sliding Head, Tapping Attach. Drill Press
Leland & Gifford 4 Spindle, Power Feed to spindles, M.D.

MILLING MACHINES
#5 Cincinnati Hi Power, Rapid Power Traverse, M.D.
#3 Cincinnati S.P. M.D.
#3 Hendey, S.P. M.D.
#2 & #3 Kempsmith, M.D.
#2 Brown & Sharpe, M.D.
#1 & #2 Cincinnati Univ. M.D.
#2 Van Norman, M.D.
#OY Brown & Sharpe
#O Brown & Sharpe
#25 Bilton, M.D.
#13 Garvin
#7H Becker Production
#2 & #3 Cincinnati and Brown & Sharpe Vertical, M.D.
#5C Becker Vertical, M.D.

SHAPERS
32" Stockbridge M.D.
24" Ohio S.P. M.D.
20" Gould & Eberhardt S.P. M.D.
18" Juengst M.D.
18" Springfield M.D.
18" Flather M.D.
18" Hendey M.D.
17" Smith & Mills S.P. M.D.
16" Potter & Johnston, M.D.

TURRET LATHES
#2A Warner & Swasey, M.D. with tools
#2, #4, #6 Warner & Swasey, M.D. with tools
#1B Foster Universal

LATHES
86"x15' Centers Putnam
65"x20' American 8 speed G.H. M.D.
48"x72"x20' Harrington, G.H. Sliding bed gap
36"x18' Putnam Double Back Geared, Int. Geared Fave Plate Driven, M.D.
27"x10' American Super Prod. Pump & Fittings, pan bed. 1941 machine
25"x18' Leblond, G.H. M.D. pan bed, taper attach.
24"x14' Boye & Emmes
24"x12' Advance, Q.C. M.D.
24"x12' Putnam
24"x12' Leblond, M.D. Pan Bed. 1941 machine
22"x12' Leblond, M.D. Pump & Fittings, Pan Bed. 1941 machine
20"x10' LeBlond Production, 1941 machine.
20"x12' Fay & Scott, M.D. Q.C. 1941 machine
18"x36" Rahn & Larmon Gap, Q.C. M.D.
18"x8' Hendey, M.D. Taper Attachment.
18"x8' Leblond, Heavy, M.D.
16"x6' Lodge & Shipley, 1941 machine
16"x8' Lodge & Shipley, M.D.
16"x8' Pratt & Whitney Tool Room, Taper, M.D.
16"x6' South Bend
16"x6' Reed Prentice, G.H. M.D.
16"x6' Wooster G.H. Q.C. M.D.
14"x6' Pratt & Whitney Tool Room, Taper, M.D.
14"x6' South Bend
12"x4' Clausing
12"x3' Sunstrand G.H. Taper
10"x36" Logans

GRINDERS
#3 Brown & Sharpe Cylindrical
10"x48" Norton
6"x10"x36" Norton Surface, Type G. 40x9 Magnetic Chuck
#70 Internal
#1-G Abrasive Internal, M.D.
#5 Covell Surface
12" Pratt & Whitney Vertical Surface
Sterling Tool & Cutter
Bridgeport Knife Grinder
Stanley Double End Bench Grinders

MISCELLANEOUS
8' Robinson Power Press Brake, 16 gauge
8' Foote Brake
8' Foote Shear
Honing Presses
Various sizes Power Presses
4 Rafter Machine Co. 3, 5, 7 & 8 Head Metal Moulding Rollers, M.D. with Angle Drives, Feeding & Straightening Rolls, complete with motors, starters and all extra equipment. Can be operated as one set.
2 Sets Rollers, 3½" Spindles, 7" between housing. Can be operated as one set.
800# Chambersburg Steam or Air Hammer
Smalley 6" Thread Miller
#4 Nielson 4 Slide Machine
#3 Manville 4 Slide Machine
Manville Header
#2 Waterbury-Farrel Header
8"x11" Robertson Hacksaw, M.D.
12'x¾ Loy & Nawrath Power Press Brake
50 Ton Screw Press
175 Ton Hydraulic Press, complete with pump
6x14 Pratt & Whitney Thread Miller
Gould & Eberhardt Gear Cutter

S & S MACHINERY COMPANY
207 CENTRE STREET **Telephone: WOrth 4-5710** **NEW YORK 13, N. Y.**

MILLING MACHINES
#2 Jackson Vertical Miller, M.D.
#3H K & T Sliding Head Vertical Millers, M.D.
1—5' American triple purpose plain radial drill, motor on arm.
#4 Cincinnati High Power Plain Miller, S.P.D.
#4 Cincinnati Vertical Miller, H.P.S.D.
6' American Triple Purpose Plain Radial Drill, M.D.

GRINDERS
Lees Bradner Gear Grinder.
Simplicity Piston Grinder.
12" x 96" Landis Plain, S.C.

GEAR MACHINERY
18" Gleason Bevel Gear Generators.
6" Bilgram Bevel Gear Generator.
#4—36" B & S Automatic Gear Cutter.
Lees Bradner Gear Grinder.
#6 Fellows Gear Shaper, Cone.
#2 Pfauter Gear Hobber.
36" Gould & Eberhardt Automatic Gear Hobbing Machine, Motor driven.

PLANERS
42" x 42" x 20' Cincinnati Hypro, 4 Heads, D.C. drill.
24" x 24" x 6' Gray Planer.
26" x 26" x 8' Woodard & Powell, 2 Hds.

MISCELLANEOUS
14" Niles Slotter
#4 La Pointe Broach

CINCINNATI MACHINERY & SUPPLY CO
217 East Second St., Cincinnati, Ohio

MILES' HIGH GRADE TOOLS

Air Compressor, 92' Ingersoll Rand
Air Compressor, 1400' Sullivan
Automatic No. 0 Brown & Sharpe
Automatic, 4½" Gridley "II" 4 spdl. chucking
Automatic, 7" Baird 6 spdl. chucking
Brake, 10' x 10 ga. Dreis & Krump leaf
Balancer, Micropoise flywheel
Balancer, 44" Norton
Broach, No. 3, J. N. Lapointe double
Die Casting Machine, AC Spark Plug Co.
Drill, with tapping attmt. 25" Weigel
Drill, Nos. 2 & 3 Henry Wright sens.
Drill, Nos. 11 & 12 Natco multiple
Drill, 4' Western radial, Timken bearing
Drill 20", 21", 24" Cincinnati Bickford
Furnace, Lindberg pot type
Furnace, Surface Combustion drawing
Gear Hobber, 16MS Gould & Eberhardt
Gear Hobber, No. 1 Lees Bradner
Gear Lapper, 8" Red Ring
Gear Generator, 18" Gleason spiral bevel
Gear Tester & Lapper, 18" Gleason bevel
Gear Chamferers, Peerless & Lipe
Gear Cutters, 36" & 48" Brown & Sharpe
Grinder, 12" x 36", 16" x 36", 16" x 52" Landis
Grinder, 16" x 48" Landis crankpin
Grinder, No. 72 Heald sizing internal
Grinder, 20" Gardner semi-auto. disc.
Grinder, 8" x 24" LaSalle surface
Grinder, 12" x 24" Diamond surface
Grinder, 24" Cincinnati face milling cutter
Honing Machine, No. 211 Barnes
Lapper, No. 10U Norton
Lathe, Turret, No. 3B Foster
Lathe, Turret, 22" Libby
Lathe, Turret, 28" Libby, 4½" or 7½" hole
Lathe, Turret, 36" Bullard vertical, Rap. Pro.
Mill, 42" Bullard vert., 1 plain, 1 turret head
Mill 3" Universal horiz. boring
Miller, No. 2 Heavy Brown & Sharpe
Miller, No. 2 Van Norman duplex
Miller, No. 2 Brown & Sharpe vert.
Miller No. 3 Reed Prentice vertical high speed
Miller, 30" Newton Continuous rotary
Miller, No. 1 Davis Thompson duplex
Miller, Type C Hall Planetary thread
Miller, Size 3 Turumillers
Miller, Types 10 & 45 Productomatic
Miller, 48" Oesterlein tilted offset
Planer, 24" x 24" x 5' Gray
Planer, 36" x 36" x 16" Cleveland openside
Press, 51" No. 8G84 Ferracute dbl. cr.
Press, 34", No. 174 Consol. gap dbl. cr.
Press, 28", No. 71 Swaine double crank
Press, No. 53 Toledo straight side
Press, No. 6 Waterbury Farrel openback
Press, No. 33 Consolidated arch frame
Press, No. 2 Standard screw type
Riveter, Nos. 2A 5½B & 7B High Speed
Roll, No. R60 Yoder fender crowning
Roll, Forging, No. 1 Ajax Evans
Scraper, Anderson electric
Screw Driver, No. 61AA Bodine
Screw Driver, Model C Detroit
Sprue Cutter, Model 1 Tessmer
Saws, 4", 7" & 8" Higley cold
Tester 22 lb. Tinius Olsen drop
Tester, 60,000 & 230,000 lb. Olsen torsion
Tapper, Natco 1 & 2 way lead screw
Threader, ¾" Economy stud
Welder, 80 KVA Taylor Winfield butt
Welder, 7 KVA Winfield automatic spot

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Draw Block, Double, 22", M.D.
Drill, D-4 Colburn, H.D., #5 M.T.
Grinder, 10' Bridgeport, Knife.
Keyseater, #3 Catlin, 23"x2", M.D.
Miller, Universal, #3 Cincinnati, M.D.
Miller, Vertical, #3 B. & S., S.P.D.
Miller & Shaper, #14 Cochrane-Bly, Vert., M.D.
Shapers, 20"-24"-32".
Shaper, 36" Morton, Draw Cut.

West Penn Machinery Company
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FLATHER 16" x 6' Q.C.G. Lathe.
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CIN.-BICK. 28" Drill Press, P.F.; T.A.
J & L 8" x 36" Turret Lathe, MD.
MILWAUKEE No. 2-B Double Over-Arm Plain Miller, MD.
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CYLINDRICAL GRINDERS *for* SUPER-GRINDING *and* MICRO-FINISH

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10x36	14x36	16x30
10x50	14x50	16x50
10x72	14x72	16x72
10x120	14x96	18x96
		18x168

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SURPLUS TOOL STEELS • FORGED BARS

Bethlehem XX and XXX, Columbia Special, Darwin Chrome Tungsten, Deward, Graphmo, LaBelle Silicon, Neor, and Sanderson.

Rounds up to 6" Diameter • Squares up to 8" x 8"
Flats up to 2" x 10"

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Seattle Division
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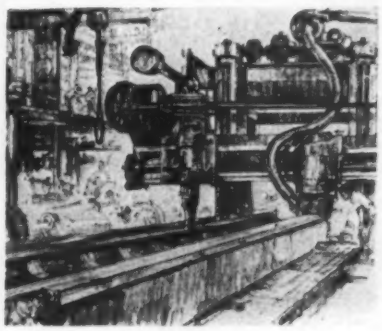

By Simmons

Every machine listed in this column is in our warehouse at press time.

27" BRIDGEFORD AXLE LATHE
42" N.B.P. Car Wheel Borer
66" NILES-BEMENT-POND Tire Boring and Turning Mills, M.D.
2½' HENRY-WRIGHT Sensitive Radial Drill
4' HAMMOND Hi-Speed Sensitive Radial Drill, M.D.
7' CARLTON Plain Radial Drill
7' AMERICAN Universal Radial Drill
33"x9" GOULD & EBERHARDT Spur Gear Cutter
42" PUTNAM Double End Car Wheel Lathe, M.D.
#5 BROWN - SHARPE Plain Miller, M.D.
#3-B MILWAUKEE Plain Miller
#2 CLEVELAND Plain Miller
#10 NILES Vertical Milling Machine
#6 BECKER Vertical Milling Machines
30"x30"x10" NEWTON Slab Miller
12"x12" ACME Power Hack Saw, M.D.
98"x36"x42' SOUTHWARK Heavy Planer, Four Heads, 230 Volt, D.C.
72"x72"x18' N.B.P. Heavy double deck Planer, 4 Heads, 230 Volt Reversing Motor Drive
48"x48"x24' N.B.P. Heavy Planer, Two Rail, One Side Head, M.D.
48"x48"x20' PATCH Planer, 4 heads, 230 volt D.C. Rev. M.D.
24"x24"x6' WHITCOMB Planer, 230 Volt D.C. Reversing M.D.
12" SELLERS Slotter, M.D.
20" SELLERS Slotter, M.D.
4"x4" capacity ALLIGATOR shear, U.E.F., M.D. 24" Blade
#1 L&A Multiple Punch, 100 Tons, 72" between housings
6"x6"x⅝" SOUTHWARK Double Angle Shear
SCHULTZ-NAUMANN Beam Shear, 20", 60 lb. and smaller
60" Throat, 8"x1 1/16" LONG & ALSTATTER Shear
2" LANDIS Pipe Threading Machine, M.D.
6" BIGNALL-KEELER Improved Pipe Machine
#120 GARDNER Double Spindle Disc Grinder
4" BAKER Heavy Duty Automatic Tapping Machine

SIMMONS ENGINEERED Machine Tool REBUILDING

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EASTERN OFFERS FROM STOCK

Eastern Rebuilt Machine Tools

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No. 2A Brown & Sharpe Universal, m.d.
No. 3 Cincinnati H.P. Universal, m.d.
No. 3B Milwaukee Plain, double overarm, m.d.
No. 4B Milwaukee Plain, double overarm, m.d.
No. 4 Cincinnati H.P. Plain, rect. overarm, m.d.
No. 4 Cincinnati H.P. Plain, round overarm, m.d.
No. 5B Heavy Brown & Sharpe Plain, m.d.
No. 5 H.P. Cincinnati Plain, rect. overarm, m.d., extra heavy type Garvin Hand, m.d.

VERTICAL MILLING MACHINES

No. 2M Cincinnati, m.d. in base, p.f. rotary table, latest type, pract. new
No. 2 Brown & Sharpe, s.p.d.
No. 2 Knight, m.d.
No. 2 Kempsmith Vertical Maxi-Miller, m.d. in base late type
No. 3 Cincinnati H.P. Vertical, m.d.
No. 3B Milwaukee Vertical, m.d. in base
No. 4 Cincinnati Vertical High Power, m.d., latest type, brand new built in 1943
No. 4 Knight Vertical, m.d.
No. 5 Jacksons, m.d.
No. 6 Becker, cone
2 spindle Newton, m.d.

MANUFACTURING MILLING MACHINES

No. 4-36 Cincinnati Plain Hydromatic, m.d. in base, latest type
No. 34-36 Cincinnati Plain Hydromatic, m.d. in base, latest type
No. 34-36 Cincinnati Duplex Hydromatic, m.d. in base, latest type
No. 34-36 Cincinnati Duplex Hydromatic m.d. in base, with tracer control on each head, latest type, practically new
24" Cincinnati Duplex Automatic, m.d. National Standard Spindle
28" Cincinnati Plain Automatic, belt
6x14" Pratt & Whitney Thread Miller, belt
1½x12" Pratt & Whitney Thread Miller, m.d.
6x48" Pratt & Whitney Thread Miller, m.d.
6x80" Pratt & Whitney Thread Miller, m.d.
Carter & Hakes Mfg., belt
No. 2 and 12 Pratt & Whitney Lincoln Type, belt
Burr Mfg., m.d.
36"x36"x14' Bement Slab, m.d.
54"x54"x10' Liberty Planer Type, m.d., p.r.t.

MANUFACTURING LATHES

17"x124" centers LeBlond Rapid Production, m.d. in base, latest type, prac. new (2)
No. 9 LeBlond Multi-Cut, m.d.
3x30" LoSwing, m.d.
3½x36" LoSwing, s.p.d.
8x84" LoSwing, m.d.
9x12" Sundstrand Mfg., s.p.d.
11"x4' Wells Speed Lathe
15"x6' Automatic Threading Lathe
20"x6' American, arranged for spindle boring
42x96" No. 5 Niles-Bement-Pond Car Wheel Lathe, m.d., new
42x96" No. 5 Niles-Bement-Pond Car Wheel Lathe, m.d., used
Niles-Bement-Pond Axle Lathe, center drive
Niles-Bement-Pond Quartering Machine, m.d., new

PLANERS

30"x30"x10' American, 1 head
24"x24"x6' Pond, 1 head
30"x30"x14' G. A. Gray, 2 heads
36"x36"x10' Niles, 2 heads
36"x36"x10' Niles, 2 heads
36"x36x10' Ohio, 1 head
36"x36"x12' Powell, 2 heads
36"x36"x20' G. A. Gray, 2 heads
36"x36"x20' Cincinnati, 2 heads
42"x42"x20' Cincinnati Hypro, 4 he ds, reversing m.d.
42"x42"x26' G. A. Gray, m.d., 2 heads
48"x48"x40' Sellers, 2 heads, reversing m.d.
60"x60"x16' Niles-Bement-Pond, 4 heads, reversing m.d.
60"x60"x20' Cincinnati, 4 heads, m.d.
60"x60"x20' G. A. Gray, 4 heads, m.d., box table
60"x60"x40' Niles-Bement-Pond, 4 heads, reversing m.d.
72"x72"x24' Niles-Bement-Pond, 4 heads, reversing m.d., box table
96"x72"x18' Pond, belted m.d., 4 heads

PRESSES

B45 Metalwood Hydraulic
B33 Metalwood Hydraulic
851Ferracute Double Crank, 28" between uprights
No. 206½B Toledo D.C. Toggle Drawing
No. 496D Toledo D.C. Toggle Drawing
No. 9 Springfield Straightening

SHAPERS

22" Niles Traveling Head, belt

We carry an average stock of 1,000 machines. No priority needed for rebuilt machines.

The EASTERN MACHINERY CO
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CINCINNATI 29, OHIO

MOREY
Dependable Used Machines

LUCAS #1 Horiz. Boring Mill—3" bar, M.D.
BULLARD 24" Vert. Turret Lathe—with side head; R.P.
LANDIS 20"x220" Plain Cyl. Grinder—M.D.
G. & E. 18" Univ. Gear Hobber
GLEASON 3", 6" & 11" Bevel Gear Generators—2 tool type
GLEASON 10" Spiral Bevel Gear Generator
GLEASON 15" Spiral Bevel Gear Generator
K. & T. 3B Vert. Miller—Motor in Base
INGERSOLL 24" Cutter Grinder
INGERSOLL 26"x26"x12' Planer Type Miller
SAUNDERS 8-18" Pipe Threader
TREADWELL 12" Pipe Machine

LATEST TYPE MACHINE TOOLS — Built in 1942
DEFIANCE #25-A Horiz. Boring Mill—3¾" bar
GLEASON 12" Straight Bevel Gear Generator
GLEASON 3" Straight Bevel Gear Generators
PRATT & WHITNEY 4½"x12" Thread Miller—Model C
ALL MOTOR DRIVEN AND INCLUDING 3 phase, 60 cycle, 220 volt A. C. motors

GRAY 36"x36"x10' Planer—2 heads
GRAY 44"x36"x10' Planer—3 heads
GRAY 60"x48"x14' Planer—3 heads
N.B.P. 48"x36"x14' Planer—3 heads—box table
L. T. SCHAEFER 100 ton Horiz. Hyd. Forcing Press
LYND FARQUHAR 26" Openside Crank Planer & Shaper
GISHOLT Precision Balancing Machines
BAUSH Gun Barrel Rifling Machine
ESPEN LUCAS #138 Cold Cutting Saw—Cap. of blade 12"
SLEEPER & HARTLEY Coil Winding Machine
CINCINNATI Gear Burnisher

THIS IS A PARTIAL LIST
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MOREY MACHINERY CO., Inc.
410 BROOME ST., NEW YORK

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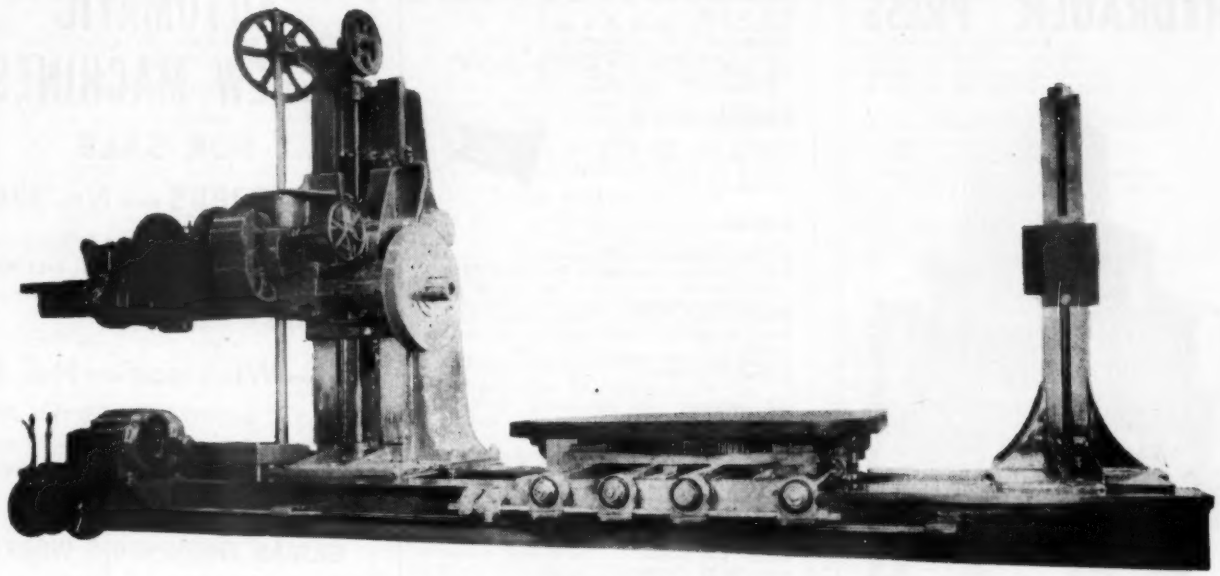

8" BEMENT MILES HORIZONTAL BORING MACHINE

Diameter of spindle 8" — 36" gear driven face plate — Spindle traverse 54" — Max. spindle to outer support 15'6" — Table 96" x 96". Minimum center of spindle to table 6" — Maximum center of spindle to table 72" — Adjustment of head on column 66" — Table cross travel 72", power — Table rotates 360°, power — Table longitudinal travel 10', power — Outer support bearing power raise and lower with head — Threading attachment.

12½ H.P. 600/1200, 230 volt D.C. motor and controls.

EMERMAN MACHINERY CORP. 875 WEST 120th STREET CHICAGO 43, ILL.

ST. LOUIS' Headquarters For Good Used Tools, Offers:

ROCKFORD 24" S.P.D. Shaper
CLEVELAND 36" x 8' Openside Planer
MUELLER 4½" Gear Box Drive Radial Drill
CIN. 36" x 36" x 10' 2-H.D.S. Planer D.H.
BARNES 4-Sp. Geared Camel Back Drill
BULLARD 24" M.D. Vert. Turret Lathes (2)
CIN. 48" Pl. Auto. Miller M.D.
NILES 12" Vert. Slotter
MILWAUKEE #3-B Vert. Miller, M.D.
BLANCHARD 28" Vert. Surf. Grinder
DIAMOND M. D. Horiz. Surf. Grinder
CLEVELAND 2½" Bar M.D. Horiz. Boring Mill
BROWN SHARPE #3 Pl. Horiz. Miller
NILES 84" M.D. Vert. Boring Mill 2 HDS.
SMALLEY GENERAL #23-A Thread Miller
AMERICAN 24" x 12' M.D. Grd. Hd. Lathe

Write Us For Any Other Tools You May Want.
Let Us Quote On All Machinery Needs.

McDONALD MACHINERY CO.
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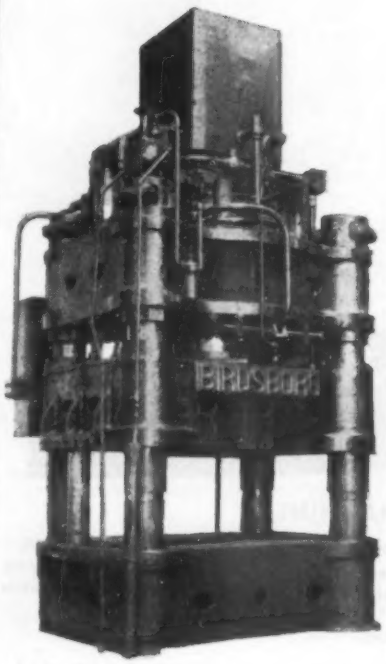

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Boring Machine—Coulter Diamond Borer
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Hammer—Bendry ‡6—150 Lb. Power
Hammer—Bliss 300 Lb. Drop
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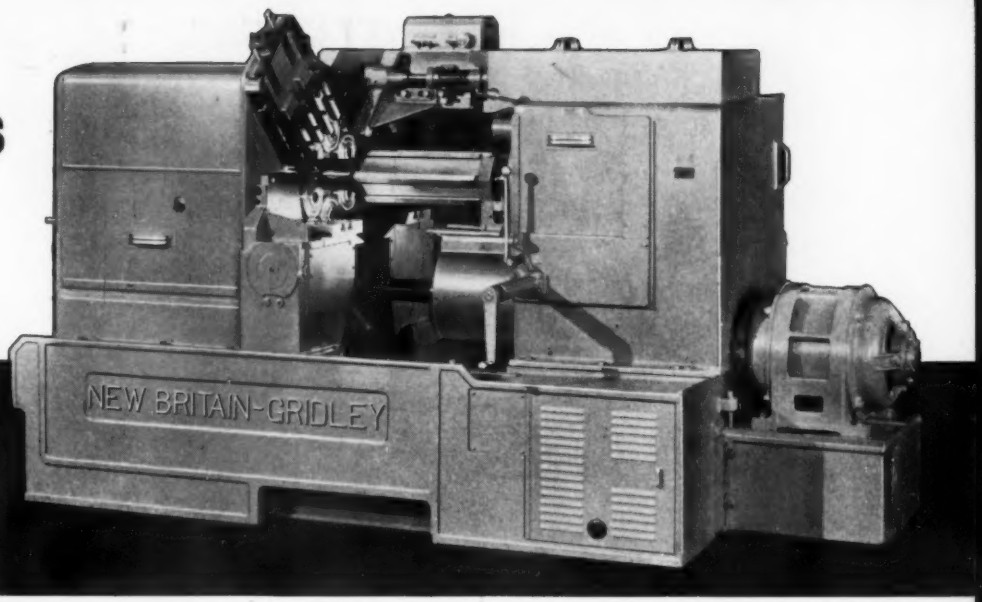

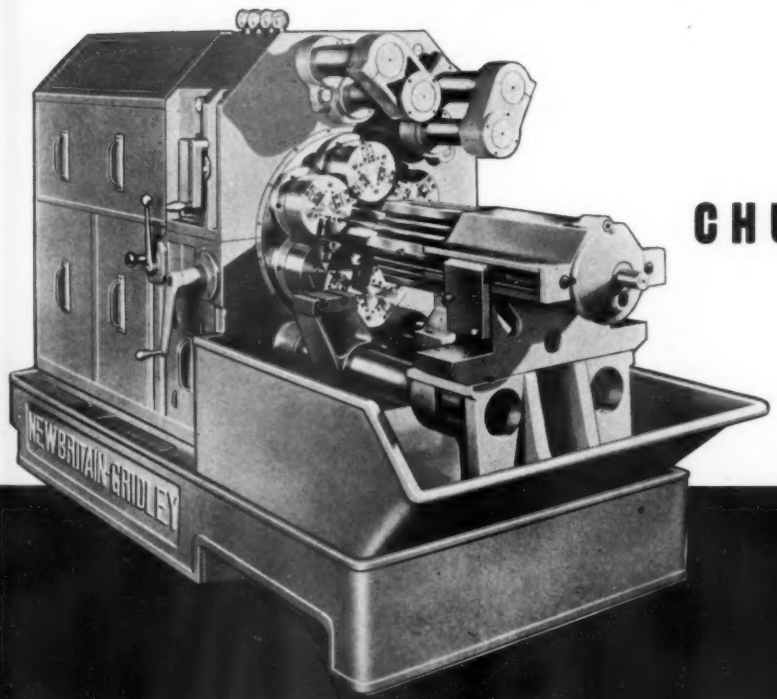

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